The Journal

OF THE

AMERICAN ASSOCIATION OF NURSE ANESTHETISTS

Isabelle M. Anderson

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Part I

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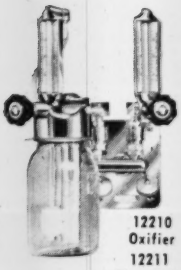

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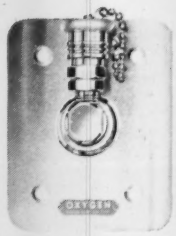

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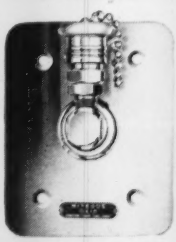

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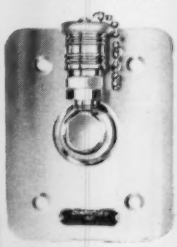

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OPINION REVIEW

NURSE ANESTHETISTS AND THE A. N. A.

The place of nurse anesthetists in the American Nurses' Association has been a moot question since the organization of the American Association of Nurse Anesthetists in 1931 and the aborted attempt to affiliate the following year. The Structure Study of National Nursing Organizations and the adoption at the 1950 Biennial Nursing Convention of the "Two Part" plan for reorganization have caused a resurgence of interest in the possibilities of affiliation by some members of the A.A.N.A. In the report of the President at the annual meeting of the A.A.N.A. in Atlantic City, the opinion was expressed that the nurse anesthetists should "set their own house in order" before considering affiliation. The following opinions are a continuation of a discussion of the subject in the February JOURNAL.—*Ed.*

It is my firm conviction that only a small number within the American Association of Nurse Anesthetists has for its primary interest the American Nurses' Association, and this is the privilege of any nurse anesthetist who desires such membership. However, I am of the opinion that we cannot serve two masters at one and the same time.

In fairness to our now large membership, most of whom may be quite unfamiliar with the set-up we desired and asked for with the A.N.A. during our infancy in November 1931, the correspondence is quoted verbatim.

11/16/31

To the American Nurses' Association,
Miss Susan C. Francis, Secretary
470 7th Ave.,
New York, N. Y.

Dear Madam Secretary:—

The International Association of Nurse Anesthetists, recently organized with headquarters in Cleveland, Ohio, desire the privilege of affiliating with the American Nurses' Association. Therefore the Association herewith makes formal application for such relationship.

In making this request it is with the hope that the Association of Nurse Anesthetists will be permitted to affiliate with the American Nurses' Association just as the other three organizations do. Namely: The Red Cross, Public Health, and the National League of Nursing Education. We feel that this contact will prove of mutual benefit to all and will also stimulate interest in the American Nurses' Association among our members. Find copy of Constitution, By-Laws and Standing Rules herein.

Hoping that this will receive favorable consideration and that we will have the pleasure of this affiliation during the Biennial Convention in San Antonio in April, with every good wish for your continued success, I am,

Cordially yours,
(Miss) Agatha C. Hodgins, President
International Association of Nurse Anesthetists.

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The reply to this request was as follows:-

May 3, 1932

My Dear Miss Hodgins:—

The application of the National Association of Nurse Anesthetists for affiliation with the American Nurses' Association was considered at a meeting of the Board of Directors of the American Nurses' Association held in San Antonio, Texas, on April 9th, 1932, and it was voted as follows:

That inasmuch as the avenue to membership in the American Nurses' Association of all nurse anesthetists should be the avenue already established; namely, through their Alumnae, District and State Associations, the application for membership of the National Association of Nurse Anesthetists for affiliation with the American Nurses' Association could not be accepted.

We believe that many nurses in your Association are already members of the American Nurses' Association, and hope that those who have not yet so allied themselves, will desire to do so in the near future.

Very sincerely,
Susan C. Francis, Secretary,
American Nurses' Association.

Miss Hodgins replied to Miss Francis' letter of May 3, 1932, as follows:-

My dear Miss Francis:—

Your letter of May 3rd, conveying the decision of the American Nurses' Association in regard to our request for affiliation, will be brought to the attention of the members of the National Association of Nurse Anesthetists.

Although we deeply regret that affiliation with the American Nurses' Association is apparently not possible, we can see no reason why an earnest desire to safeguard a vital work, by those who know most about it, should make any member of this Association less interested in the American Nurses' Association. It is, however, our firm opinion that the interests of nurse anesthetists will be best served by having a distinct organization, chiefly concerned with obtaining certain objectives. We sincerely hope that this will be the steadily growing conviction of those concerned in and entrusted with the work of anesthesia.

Very sincerely yours,
Agatha C. Hodgins, President,
National Association of Nurse Anesthetists.

In view of the foregoing facts, the matter of affiliation was definitely settled some twenty years ago by the American Nurses' Association. There is nothing in common between the two groups; therefore any further consideration concerning this would be disastrous to the well being of the American Association of Nurse Anesthetists, as the end result would be doom by domination, with loss of individuality of our very fine organization.

The American Hospital Association came to our rescue just after the above incident. It has been to our organization as the old adage states so well: "A friend in need is a friend indeed." The American Hospital Association has been most helpful to our association in many ways throughout the years and is right at this time working diligently with our committee on the accreditation program for schools of anesthesia, which when completed will be of marked value to all concerned. The American Hospital Association is more concerned with the welfare of the nurse anesthetists, as has been evidenced through the years of their co-operation, than could be hoped for from the American Nurses' Association.

The American Association of Nurse Anesthetists has progressed very satisfactorily since its organization, so why even consider a change when there could be nothing to gain.

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I do earnestly request that each member of the American Association of Nurse Anesthetists send me without delay at least a penny postal card conveying an opinion in regard to this matter.—VERNA M. RICE, R.N., 2360 St. Stephens Rd., Mobile 17, Ala.

Where does the advantage lie—for us and all others concerned—in closer union with the American Nurses' Association or in our present position of relative freedom with the American Hospital Association? From the practical standpoint the A.H.A. is perhaps in a better position to understand our problems. In the vast majority of instances the department of anesthesia functions directly under the chief surgeon or the director of the hospital rather than under the director of nurses. Methods used and equipment purchased are discussed with the surgeons and hospital authorities and, I believe, very properly so.

Situated as we are, we are free to develop our program to the best of our ability and are helped to do so by both surgeons and hospital administrators. When and if we do not measure up to the standards required of us, we will be replaced by some other group. That would be the end result under any organization. Basically we are nurses, and we are in complete sympathy with all efforts being made to improve the education of nurses, but our specialty must always maintain its separate schools for postgraduate study for reasons so obvious that they need not be enumerated.

Again, I fear the too great centralization of power in nursing organizations no less than in state and national politics. That subject is much to the fore at this time. Present instances are the attempts at the socialization of medical care. In Iowa, and so far as I know it may be true in other states, there is an effort being made now to eliminate examining boards of nurses, pharmacists, and so forth, and centralize all under the Secretary of State. Where would that lead us? I wonder! I have always felt that keeping the accreditation of schools and of anesthetists in our own hands rather than making it a responsibility of the state is a wise plan. Even we are a large enough organization so that it must be said of us that "large bodies move slowly," but we are not so large and unwieldy as the combined nursing group or the state so that we can preserve a greater flexibility in managing our association affairs. I sometimes hear of "too much centralization" even so.

Social Security, that political device that leaves many of us still guessing what the outcome will be, is now extended to hospital personnel. And then there are old age benefits. Is there no further need for a little of that sturdy independence that allows play to individual initiative and foresight and results in personal satisfactions and feelings of having achieved maturity?

Associations to function must have meetings. Many of us find it difficult to attend the meetings of our own group. Could we find the time and opportunity to attend any more?

With feelings of greatest friendliness for all nurses, I nevertheless believe we can be most effective by cultivating our respective fields and working jointly on large problems when the occasion demands.—LOUISE SCHWARTING, R.N., Fort Dodge, Iowa.

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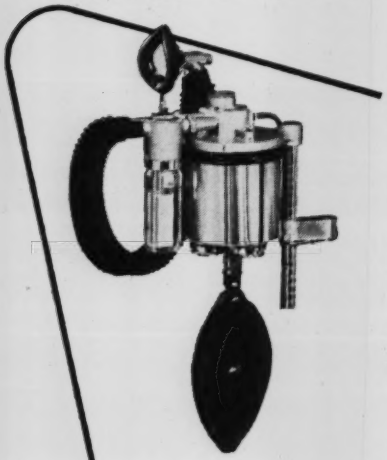

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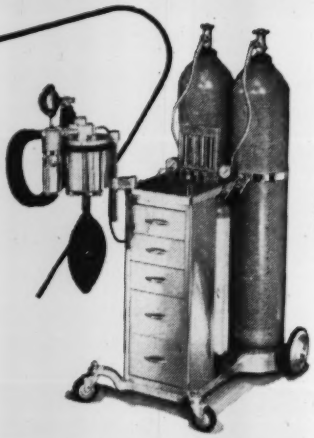

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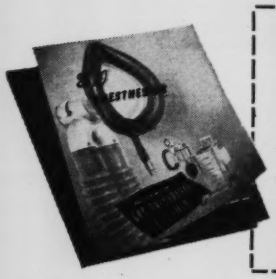

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The Journal of the American Association of Nurse Anesthetists

VOLUME XIX MAY, 1951 NUMBER TWO

THE GOAL OF ACCREDITATION

The recent appointment of Dr. Eugene S. Lawler, Dr. Adam R. Gilliland, and Dr. Raymond N. Lowe as advisors to the A.A.N.A. accreditation program climaxes an effort with a history that parallels that of the Association. During twenty years of slow but steady progress the foundation has been laid for full realization of one of the Association's primary objectives: the establishing and maintaining of high educational standards for nurse anesthetists through the accreditation of schools in which they are trained. The end is now in view.

Those who know the most about the work—the anesthetists themselves—are to formulate the criteria for accreditation through the medium of workshops conducted by the accrediting advisors. This is at once an honored and weighty responsibility to which every best effort will be brought. In setting the accreditation program into motion those concerned have a wealth of experience from which to draw—experience gained from the Association's other educational programs. Nurse anesthetists owe an expression of gratitude to their leaders who have built a solid organizational structure for the support of the accreditation program and a wish for "fair winds" for those who are carrying on.

THE FRANTIC FIFTIES

This infant decade is already being labeled by the pundits as the Frantic Fifties. And by the reckless abandon with which everyone is leaping on the whirling carrousel of the time, one wonders whether anyone wants to be conscious when it's over. Only a gull would be caught saying, "Slow down. The party's just started." Evidently, there is a mass psychosis about being left behind by the smart boys who are making a rapid buck and having a whee of a spree.

This is dangerous business, particularly for professional workers who at best are forced to draw liberally from their nervous energy. Once started, the uncontrollable cycle of hoppy nerves and tense muscles is not too easy to stop, and in the interim impersonal receptivity and clear vision go by the boards. Making decisions under such condi-

tions is like blowing in a full cigaret tray; it leaves a taste of ashes in the mouth.

The speed-up of the economy for purposes of defense, in addition to the high tempo of easy money times, is bound to affect physicians, nurses, and all other hospital employes, and on occasion the pressures may become well nigh unbearable. However, responsibilities are never so weighty, the days so bob-tailed, or the grab so important to gratification that there isn't time for good work, good sleep, good food, and good clean fun. Society has no gratitude for the person who cracks up at its expense; it saves its reward for him who knows how to conserve as well as expend his energy.

COMPLICATIONS ASSOCIATED WITH SPINAL ANESTHESIA

Clarence L. Hebert, M.D.*
Staten Island, N. Y.

I have been asked to discuss a subject that should be of interest and concern to all of us, namely, the complications associated with spinal anesthesia. This form of anesthesia stands out from the various other methods of anesthesia in one respect at least. I refer to the tendency for both medical and nonmedical persons alike to bring to mind the possibility of complications whenever spinal anesthesia is mentioned as the method of choice.

The general medical practitioner fears an intractable headache that might be troublesome to his patient during convalescence. The cardiologist warns of the sudden decrease in blood pressure that may be expected, with its deleterious effects on the patient with coronary artery disease. The neurologist is concerned with the possible adverse effects on the spinal cord and its associated structures. To the layman the term "spinal anesthesia" conjures up the vision of a cripple confined to a wheelchair as the aftermath. Fortunately, no other type of anesthesia is judged solely on the basis of its complications with little consideration being given to its merits and its undeniable advantage over other forms of anesthesia in certain instances.

The technic of introducing anesthetic drugs into the subarachnoid space to abolish temporarily the sensory and motor functions of several groups of spinal nerves was introduced by Bier fifty years ago. During the ensuing period spinal anesthesia has been widely utilized throughout the world. The technical simplicity of the procedure of lumbar puncture led to the administration of spinal anesthesia by the surgeon to overcome the deficiencies of other available methods of anesthesia. As the total experience with spinal anesthesia accumulated, improvements in drugs and technic took place. Today spinal anesthesia has a recognized place in the practice of anesthesiology.

Two restraining influences have checked the more widespread use of spinal anesthesia. These are the alterations in normal physiology accompanying the extensive block of somatic and autonomic nerve pathways and the occurrence of certain sequelae that may result from the introduction of needles, drugs, or foreign material into the subarachnoid space. Throughout the last half century the medical literature has been replete with reports of complications of every conceivable type attributed to spinal anesthesia. Often the etio-

Read before the Seventeenth Annual Meeting of the American Association of Nurse Anesthetists, Atlantic City, September 20, 1950.

*Chief, Anesthesiology Department, U. S. Marine Hospital

logic relationship is not made clear, the causal relation being based on the assumption that because spinal anesthesia was used it was at fault. Untoward reactions occur during and after the administration of spinal anesthesia, just as they do in other methods of anesthesia. The prevention and management of these complications are of great concern to the anesthetist who is responsible for the administration of, and the care of the patient during, spinal anesthesia.

The fear of complications from spinal anesthesia is grounds for its rejection by a considerable number of physicians and patients. Because of such prejudice spinal anesthesia may be passed over in favor of more hazardous methods of anesthesia, even in the instances in which there are clear cut indications for its use. It is only by detailed analysis and study of known complications and the circumstances under which they occurred that we can rightfully assign them a proper place among the criteria we ordinarily employ in the selection of anesthesia for a given patient.

At the hospital with which I am associated we feel that spinal anesthesia is a valuable method to have at our disposal. Approximately one half of the patients who require our services are given this form of anesthesia. Although we employ spinal anesthesia in all types of operations below the diaphragm, as a rule, we tend to use it chiefly for operations confined to the lower part of the abdomen and the pelvis, for procedures on the lower extremities, and for inguinal hernioplasty.

Recently, we reported our experience in the evaluation of the spinal anesthesia complications that we encountered over a period of thirty-nine months in a series of over 5,700 consecutive administrations of spinal anesthesia.[1] From this study we were able to conclude, to our satisfaction at least, that many of the complications of spinal anesthesia are to a large extent preventable or at least can be managed so that the incidence of permanent harm to the patient is minimized.

In our practice spinal anesthesia is administered by an experienced physician anesthetist or under his direct supervision by a resident or intern assigned to the anesthesiology service. The preparation of the materials and instruments used and the careful management of many of the patients during spinal anesthesia are duties that are carried out by the nurse anesthetists in the department. The performance of these duties by personnel with special training and interest in the field of anesthesiology contributes in no small way to the low incidence of spinal anesthesia complications.

It is perhaps unfortunate that the actual injection of anesthetic agents into the subarachnoid space is such a relatively simple technical procedure. Too often this has led to a lack of appreciation of the dangers of the method and the profound physiologic changes that accompany spinal anesthesia. The management of the patient under spinal anesthesia by a trained anesthetist, capable of handling any contingency that may arise, is a minimum safeguard, which every patient deserves. The practice of admin-

1. Hebert, C. L.; Tetirick, C. E., and Ziemba, J. F.: Complications of spinal anesthesia. An evaluation of the complications encountered in 5,763 consecutive spinal anesthesias. J.A.M.A. 142:551-555, Feb. 25, 1950.

istration of spinal anesthesia by the operating surgeon with the relegation of the management of the patient to the busy circulating surgical nurse is to be condemned as out of keeping with the high standards of medical practice today.

IMMEDIATE COMPLICATIONS OF SPINAL ANESTHESIA

The complications occurring immediately after the establishment of spinal anesthesia are directly associated with the physiologic and psychologic disturbances produced by the method. Most of these phenomena are relatively minor and are easily corrected if recognized early. The conduct and management of spinal anesthesia during the operative period necessitate an understanding of the underlying physiologic alterations that accompany the block of a considerable number of nerve pathways, as well as an appreciation of the sensations experienced by the patient who is usually undergoing a new and startling experience.

Nervousness and apprehension.—It is well recognized that many patients are psychologically unsuited to spinal as well as to other types of conduction anesthesia. Careless remarks by hospital personnel, including nurses and physicians, are responsible for an unfavorable attitude on the part of the patient in some instances. Much can be done to allay the patient's apprehension by a preanesthesia visit by the anesthetist, who explains in nontechnical language the reasons for choosing spinal anesthesia for that particular patient and just what the patient is to expect. Circumstances rarely justify the forcing of spinal anesthesia upon the patient who strongly objects to or who fears the method. Other forms of anesthesia are indicated except in unusual instances. The use of light supplemental general anesthesia is of great benefit in the management of the patient who prefers not to be conscious during the operation. Adequate preanesthesia sedation is essential to the satisfactory conduct of spinal anesthesia. Several writers have attributed nervousness and apprehension to the toxic effect of the spinal anesthetic drug itself on the central nervous system. In view of the relatively small amount of drug used and the known slow rate of absorption of drugs (such as vasoconstrictors) from the intrathecal space, one wonders if this can be considered to play any part. Nervousness and apprehension proved to be a minor complication in our series of patients, the majority of whom were middle-aged men engaged in the somewhat hazardous occupation of seamen. It was observed in only 2 per cent of the patients.

Nausea and vomiting.—Nausea and vomiting appeared in 6.2 per cent of our patients. A number of factors seem to contribute to the production of these symptoms.

Sudden changes in position, such as are necessary in administering spinal anesthesia, are known to elicit these symptoms in patients premedicated with morphine, as were all the patients in this series.

The emotional factor must be considered. Patients are apt to respond to psychic trauma with nausea and vomiting. Proper premedication is most helpful in preventing, and supplemental medication in controlling, this factor.

Increased muscular tone of the gastrointestinal tract, coupled with relaxation of the pyloric sphincter produced by splanchnic nerve block, favors the production of nausea and vomiting. On the other hand, incomplete splanchnic nerve block favors reflex nausea and vomiting produced by traction on the viscera and mesentery. A sudden decrease in blood pressure with resulting cerebral hypoxia is commonly associated with these symptoms. The administration of oxygen and the restoration of the blood pressure to normal levels by usual methods will help to alleviate the condition.

High spinal anesthesia.—High spinal anesthesia, in which the level of anesthesia is unnecessarily high for the contemplated operation, is often associated with circulatory and respiratory embarrassment. This complication occurred in about 6 per cent of our patients. The level of anesthesia to be expected in a given patient, even when a standard technic is employed, is not always predictable. The site of injection, as long as it is in the lumbar region, plays a minor role. The important factors governing the expected level of anesthesia are volume of solution injected, speed of injection, use of barbotage, and the specific gravity of the solution injected. Anatomic factors, such as the caliber of the subarachnoid space, arachnoid adhesions, and spinal curvatures, must also be considered. The injection of the spinal anesthetic at the time the patient is unrelaxed and straining, because of factors such as fear, uncomfortable position, and labor pains, may be followed by an unusually high level of anesthesia owing to currents set up in the cerebrospinal fluid within the subarachnoid space. The level of anesthesia must be carefully ascertained in each case after waiting long enough for the drug to become "fixed." Death can occur from high spinal anesthesia when the level has not been determined or has been masked by supplemental medication and when proper supportive measures have not been instituted. The management of inadvertent high spinal anesthesia depends upon its recognition and the institution of the usual supportive measures in regard to the respiratory and circulatory functions.

Decrease in blood pressure.—Cardiovascular depression is the most important complication during spinal anesthesia from the standpoint of frequency and potential harm to the patient. It is to be anticipated in every case, hence a vasoconstrictor drug is usually given before the administration of the spinal anesthesia. All of our patients received 25 mg. ephedrine intramuscularly immediately before the subarachnoid injection was performed. A moderate decrease in blood pressure, which we defined as a decrease in the systolic pressure from normal levels to between 80 and 90 mm. Hg, or a decrease in the systolic pressure of the magnitude of 30 to 40 mm. Hg, occurred in 7 per cent of the cases. A decided decrease in blood pressure, which we defined as a decrease in the systolic pressure below 80 mm. Hg, or a decrease in the systolic pressure of more than 40 mm. Hg, occurred in 4.1 per cent.

There are several theories to account for the development of hypotension and bradycardia during spinal anesthesia. Smith,

Rovenstine, and co-workers,[2] in studies of the circulatory system on anesthetized subjects not undergoing operation, concluded that stasis in the postarteriolar vascular bed, resulting from skeletal muscle paralysis plus the loss of the thoracic pump effect, produces a diminished venous return with a consequent decrease in cardiac output. This they consider the primary cause of hypotension. The maintenance of a relatively normal diastolic pressure, which depends upon arteriolar tone, associated with a pronounced decrease in systolic pressure, which indicates a decreased cardiac output, lends credence to this theory. These writers expressed their belief that the arterioles are under intrinsic autonomic control but that such factors as surgical manipulations, trauma, hemorrhage, and anoxia may upset this control to further complicate the situation.

The other and more popular theory considers a decrease in blood pressure to be due to arteriolar dilatation from block of the sympathetic vasoconstrictor fibers in the anterior roots of the spinal nerves anesthetized. Sarnoff and Arrowood,[3] using exceedingly dilute solutions of procaine that blocked only sympathetic fibers, found that the blood pressure decreased to the same extent as it did in regular spinal anesthesia with which motor paralysis occurred. This would seem to indicate that arteriolar dilatation is an important factor.

Regardless of whether hypotension is due primarily to diminished cardiac output or to increased capacity of the vascular bed through arteriolar dilatation, the degree of hypotension is proportional to the number of spinal nerve roots blocked, and the condition is usually corrected by the administration of ephedrine or related drugs that have a tonic effect on both the heart and the sympathetic myoneural junctions of the arterioles. The administration of oxygen and of fluid intravenously may be all that is required in moderate hypotension.

Obviously, one should avoid spinal anesthesia in patients with coronary artery disease, in whom a sudden decrease in the diastolic pressure for even a short period can be disastrous. Spinal anesthesia is, of course, contraindicated for patients who are in shock or are in imminent danger of going into shock.

Inadequate spinal anesthesia.—Spinal anesthesia that is insufficient to permit the operation to begin or that fails to produce anesthesia for the usually expected period is a complication that is difficult to prevent. The causes are essentially the same as those listed in connection with failures in spinal anesthesia. The management consists in appropriate supplemental anesthesia.

Failure of spinal anesthesia.—Failure to obtain spinal anesthesia after apparent successful intrathecal injection of an agent is not uncommon. Failure to place all or part of the anesthetic agent into the subarachnoid space was credited as being responsible for 99 per cent of failures with spinal

2. Smith, H. W.; Rovenstine, E. A.; Goldring, W.; Chasis, H., and Ranges, H. A.: The effects of spinal anesthesia on the circulation in normal unoperated man with reference to autonomy of the arterioles and especially those of the renal circulation. J. Clin. Investigation 18:319-341, May 1939. Rovenstine, E. A.; Papper, E. M., and Bradley, S. E.: Circulatory adjustments during spinal anesthesia in normal man with special reference to the autonomy of arteriolar tone. Anesthesiology 3:421-428, July 1942.

3. Sarnoff, S. J., and Arrowood, J. G.: Differential spinal block: A preliminary report. Surgery 20:150-159, July 1946.

anesthesia by Cullen.[4] High spinal fluid alkalinity causing precipitation of the alkaloid anesthetic base was reported as the cause of failure by Cohen and Knight.[5] The possibility that the ampule contents are not as stated on the label must also be considered.

Miscellaneous accidents, such as needle breakage, toxic reactions to drugs, and deaths directly attributable to spinal anesthesia, are sometimes reported. With the usual precautions these accidents should be extremely rare. We encountered none.

Complications Occurring in the Postoperative Period

In the postoperative period complications that are attributed to spinal anesthesia may be due to the changes produced during the period of anesthesia or may be due to the introduction of the spinal needle or certain drugs into the subarachnoid space. Frequently, the effects of pre-existing disease, drugs used in premedication or supplemental anesthesia, position of the patient during the operation, and surgical manipulations may be wholly or partially responsible for some of the so-called "postspinal anesthesia complications."

Gastrointestinal complications. — Postoperative nausea and vomiting, hiccough, and abdominal distention have been reported to follow spinal anesthesia, but they occur so infrequently in our experience that they do not seem to be related to the method of anesthesia.

Respiratory complications.— These complications occur after spinal anesthesia as well as after general anesthesia. The production of atelectasis, which may be followed by infection, depends upon a number of factors, one of which is interference with pulmonary ventilation. Spinal anesthesia contributes to the pathogenesis of atelectasis by causing paralysis of some of the intercostal nerves. The higher the level of anesthesia and the longer the duration of the paralysis, the more chance there is for portions of the lungs to become nonaerated and collapse. Thus it is advantageous for the anesthetist administering spinal anesthesia to adapt his technic to the individual requirements of each patient by providing spinal anesthesia only to a level sufficient for the contemplated surgical procedure rather than making no attempt to control the level. Obviously, a patient undergoing arthrotomy of the knee or inguinal hernioplasty will not require a level of anesthesia that paralyzes three quarters or more of the intercostal muscles, with consequent interference with pulmonary ventilation. The choice of the spinal anesthetic drug should also be considered in regard to the expected duration of the operation. It is preferable to have the spinal anesthesia disappear soon after the operation has been concluded, so that the patient will not be subjected to a prolonged period of partial respiratory muscle paralysis upon his return to his room.

Other factors play a part in the production of atelectasis. Excessive doses of drugs used in preanesthetic medication may produce respiratory depression

4. Cullen, S. C.: *Anesthesia in General Practice* (Chicago: Year Book Publishers, Inc., 1946) pp. 143-144.

5. Cohen, E. N., and Knight, R. T.: Hydrogen ion concentration of the spinal fluid and its relation to spinal anesthetic failures. Anesthesiology **8**:594-600, Nov. 1947.

and may tend to cause the mucus secretions of the respiratory tract to become more viscid. Mechanical pressure against the thoracic cage by kidney and gallbladder rests and other unphysiologic surgical positioning of the patient may interfere with respiratory movements. Patients with abnormal amounts of secretions in the respiratory tract are poor subjects for any type of major anesthesia. Elective surgery should be postponed in order to clear up such conditions when possible.

Finally, the incidence of postoperative atelectasis can be reduced by good postoperative nursing care, which is best provided in a postanesthesia-postoperative recovery room, such as is maintained in a number of institutions including our own. Here the "stir up" regimen by encouraging the patient to cough voluntarily or the administration of mixtures of helium-carbon dioxide and oxygen to increase pulmonary ventilation is of considerable benefit. In our series of cases atelectasis was recognized in 0.6 per cent of the patients, while another 1 per cent had infection of the upper or lower respiratory tract.

Genitourinary complications.—Urinary retention following spinal anesthesia occurred in 177 patients in our series, or 3 per cent. In twenty-five cases the retention persisted four days or longer and required the use of an indwelling catheter, and two of these patients had residual symptoms for two months, one developing a cord bladder that necessitated resection of the vesical neck.

Bellis[6] performed cystometric studies on ninety-four patients immediately after cessation of spinal anesthesia. He found that the desire to void was produced only by a relatively high intravesical pressure, which in itself tended to produce pressure anesthesia of the bladder wall. For that reason he advocated early catheterization.

The majority of the patients in this series, 77 per cent, had inguinal hernioplasty or appendectomy. The presence of an incision in the lower abdomen and operation on the structures of the inguinal canal are apt to influence the act of micturition by producing functional disturbances of bladder emptying.

We believe that spinal anesthesia should be used with caution in patients with a history or physical findings suggestive of prostatic hypertrophy or other difficulty with urination. Patients in the age group where prostatic hypertrophy is common should be questioned by the anesthetist in regard to urinary symptoms even though the chart indicates negative findings.

Ephedrine has the effect of increasing the tone of the vesical sphincter and has been reported to cause urinary retention, particularly in males approaching the age of prostatic hypertrophy.[7] The use of ephedrine in excessive doses or in instances where other measures might be substituted to stabilize the blood pressure is to be avoided.

Neurologic complications.—Neurologic complications occur after all types of anesthesia. Hemiplegias or peripheral nerve lesions

6. Bellis, C. J.: Cystometry after spinal anesthesia. Surgery **16**:896-905, Dec. 1944.

7. Valentine, J. J., and Fitzgerald, J. S.: Retention of urine due to ephedrine with discussion of mode of action and therapeutic usage. J. Urol. **34**:314-323, Oct. 1935. Balyeat, R. M., and Rinkel, H. J.: Urinary retention due to use of ephedrine. J.A.M.A. **98**:1545-1546, April 30, 1932.

can follow both general and spinal anesthesia. General anesthesia accompanied by recognized or unrecognized bouts of anoxia may be followed by convulsions, postoperative psychosis, or degenerative changes in the cerebral cortex or basal ganglia. Spinal anesthesia may be followed by headache, septic or aseptic meningitis, arachnoiditis, neuritis, myelitis, or the so-called "cauda equina syndrome."

Headache is the commonest neurologic sequela. The incidence of headache reported by various writers in large series of cases of spinal anesthesia varies from 1 to 25 per cent and even higher. The reason for such a variance is due to several factors, including the type of patient, the type of surgery, and the completeness of the postoperative examination for complications. Our patients who have received spinal anesthesia are visited by an anesthetist two days and seven days postoperatively, unless complications are present that call for daily examination. In our series the incidence of headache after spinal anesthesia was 6.4 per cent; only 0.25 per cent of the cases were classified as grade IV headache with a duration in excess of seven days.

There are a number of theories concerning the etiology of headache after spinal anesthesia.

Leakage of cerebrospinal fluid through the aperture in the dura, made by the spinal needle, into the peridural space is generally believed to be the causative factor. The watery cushion upon which the brain rests is thus removed allowing the brain to rest against the bony framework of the skull. This produces irritation of the dural fibers of the trigeminal and occipital nerves. Interference with venous drainage also occurs to increase venous tension. A number of workers have reduced the incidence of headache by the use of spinal needles of smaller than usual caliber, 24 or even 26 gage. Others believe that the dural defect can be made smaller by the insertion of the bevel of the needle laterally rather than caudad or cephalad, since fewer longitudinal fibers of the dura are severed by the bevel of the needle.

Chemical irritation of the pia mater by the anesthetic agent, to bring about an increase in absorption of cerebrospinal fluid to produce hypotension within the subarachnoid space, has also been mentioned. However, since diagnostic lumbar puncture is followed by headache as frequently as, or even more frequently than, spinal anesthesia is, this theory seems questionable.

Orthostatic hypotension and tachycardia accompanied by headache have been noted in patients following delivery with spinal anesthesia. It is interesting to note that Cullen and Griffith[8] reported an equal incidence of headache in two series (200 in each series) of obstetric patients, in one series general anesthesia being given, and in the other spinal anesthesia. The headaches following spinal anesthesia were somewhat more severe, however.

In the treatment of headache after spinal anesthesia bedrest with the patient's head down, mild analgesics, caffeine, and hydration are helpful. Investigation of spinal fluid pressure in pro-

8. Cullen, W. G., and Griffith, H. R.: Postpartum results of spinal anesthesia in obstetrics. Anesth. & Analg. 26:114-121, May-June 1947.

longed headache with restoration of normal pressure by subarachnoid or epidural injection of fluid is of benefit in some instances.

Cranial nerve palsies.—The mechanism is unknown. The abducens nerve, which has a considerable length of its trunk exposed as it traverses forward along the base of the brain, is the most frequently involved, perhaps owing to the sagging of the brain that is thought to occur with leakage of spinal fluid. The paralysis is usually transient.

The more severe neurologic sequelae, such as the cauda equina syndromes, septic or aseptic meningitis, and arachnoiditis, have been thought to be due to the chemotoxic effect of the spinal anesthetic agent. Histologic evidence of inflammation of the meningeal structures and of degenerative changes in the spinal cord and spinal nerves was noted by Davis[9] in experimental work on dogs that were examined a few days after spinal anesthesia with drugs given in doses comparable to those used in human beings.

However, Lundy[10] in experiments with dogs found that permanent paralysis and histologic changes did not occur unless the dose and concentration of the spinal anesthetic was greatly in excess of that employed clinically. Lundy pointed out that patients with disease of the spinal cord might have untoward results after the use of ordinary doses of a spinal anesthetic agent and that such pre-existing disease contraindicated the use of spinal anesthesia. It is generally agreed that such conditions as pernicious anemia, poliomyelitis, and metastatic carcinoma of the spine with a block of the subarachnoid space or any other clinical evidence of spinal nerve involvement should preclude the use of spinal anesthesia.

Direct trauma from the spinal needle seems to play a negligible role in the development of serious neurologic complications since these rarely occur after diagnostic lumbar puncture.

Spinal nerve neuropathies.—Since the lumbosacral nerves are exposed to the highest concentration of anesthetic agent, they are most often involved by changes that affect sensory and motor functions. Urinary retention and rectal incontinence may also be present. These neuropathies are commonly referred to by the designation "cauda equina syndrome."

The incidence of serious neurologic sequelae following spinal anesthesia is very low. Nevertheless, the possibility of such complications should be kept in mind by those who administer spinal anesthesia, because of the drastic consequences that may result to the individual who is unfortunate enough to be the one patient out of several thousand to be so affected.

Nicholson and Eversole[11] reported only five cases of serious cauda equina involvement in 21,000 administrations of spinal anesthesia. Kennedy[12] pointed out that neurologic sequelae of spinal anesthesia, such as arachnoiditis,

9. Davis, L.; Haven, H.; Givens, J. H., and Emmett, J.: Effects of spinal anesthesia on the spinal cord and its membranes. J.A.M.A. 97:1781-1785, Dec. 12, 1931.

10. Lundy, J. S.; Essex, H. E., and Kernohan, J. W.: Experiments with anesthetics. J.A.M.A. 101:1546-1550, Nov. 11, 1933.

11. Nicholson, M. J., and Eversole, U. H.: Neurologic complications of spinal anesthesia. J.A.M.A. 132:679-685, Nov. 23, 1946.

12. Kennedy, F.; Somberg, H. M., and Goldberg, B. R.: Arachnoiditis and paralysis following spinal anesthesia. J.A.M.A. 129:664-667, Nov. 3, 1945.

may occur late enough so as not to be brought to the attention of the anesthetist or surgeon, and he reported a number of such instances that came to his attention. In our series we were fortunate to have no neurologic sequelae of a permanent type, except the occurrence of cord bladder mentioned before.

In one patient a unilateral foot drop developed and lasted for three weeks. Another had weakness of one leg for several days. Four patients had transient pain or paresthesia in the legs of not more than twelve days' duration.

Septic or aseptic meningitis.—This condition may follow the introduction of organisms or chemical irritants into the subarachnoid space. Meningitis is relatively rare when proper care is taken in the selection and preparation of materials used in spinal anesthesia. Care should be taken in the performance of lumbar puncture to avoid bloody taps, which may result in blood gaining access to the subarachnoid space. Such accidents may result in a meningismus syndrome with soreness and stiffness of the cervical muscles often accompanied by headache.

Nicholson and Eversole[11] of the Lahey Clinic outlined an excellent regimen for the prevention of neurologic complications:

1. Careful cleaning and sterilization of apparatus.
2. Use of spinal anesthetic and other drugs from manufacturers' ampules.
3. Careful inspection of ampules—which should have legible labels—for breaks in wall or visible changes in contents.
4. Sterilization of ampules in colored nonirritating antiseptic solutions—no solutions containing alcohol or formaldehyde.
5. Avoidance of lumbar puncture through infected sites.
6. Spinal anesthesia contraindicated for (a) patients with known disease of spinal cord; (b) patients with protruded intervertebral disk with peripheral nerve palsies, impairment of bowel or bladder function, or elevated total protein in spinal fluid; (c) patients with known virus infection; (d) patients with history of sequelae to previous spinal anesthesia; (e) persistent paresthesia with lumbar puncture; (f) persistent bloody tap with lumbar puncture.

11. Nicholson, M. J., and Eversole, U. H.: loc.cit.

Furthermore, they suggested routine determination of spinal fluid dynamics in all patients with intractable back pain before administration of spinal anesthesia. We make this a routine practice before administration of spinal anesthesia to patients scheduled for removal of protruded intervertebral disk.

CONCLUSION

Spinal anesthesia, like other methods at our disposal that are capable of producing equal insensibility to painful manipulations and muscular relaxation sufficient to permit surgical procedures, may be accompanied by or followed by certain accidents and complications. The administration of spinal anesthesia is technically simple. The ability to perform lumbar puncture and inject an anesthetic agent does not by itself qualify one to administer spinal anesthesia to patients. A knowledge of the fundamentals of anatomy and physiology and of the agents and methods, coupled with proper and intelligent choice of anesthesia and careful management of the patient, is essential for those using spinal anesthesia if the number and severity of complications are to be minimized.

GENERAL PEDIATRIC ANESTHESIA

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During the past ten years there has been evidence of increasing interest in the specialized field of pediatric anesthesiology; this article is a general outline of what the Anesthesia Department at the Children's Medical Center, Boston, is doing at the present time.

MINOR SURGICAL PROCEDURES

Minor procedures are performed in the surgical out-patient department and include circumcisions, the excision of subcutaneous cysts, the suturing of lacerations, the setting of fractures, and proctoscopies. All of these operations are considered minor procedures in the eyes of the surgeon, but they can present major problems for the anesthetist. For example, a frightened child is brought to the hospital after an accident that occurred shortly after a full meal. Prompt surgical treatment is deemed necessary. Here the anesthetist is faced with a much greater problem than the surgeon.

Some considerations about anesthesia for these types of minor surgery are:

1. For premedication morphine, and sometimes nembutal, and atropine or scopolamine are given to alleviate fear and for the drying of secretions.

2. Vinethene and ether or cyclopropane are given as rapidly as possible so that the retching period is eliminated.

3. When the proper depth of anesthesia has been reached, the trachea is intubated, and the tube is left in place until the patient's reflexes are active. The patient is usually allowed to go home at the end of several hours. If intubation is not used routinely, an occasional patient will vomit and aspirate large particles of food, even though hours may have elapsed after eating. Such an accident may be of major importance in the development of pulmonary complications.

PLASTIC SURGERY

Cleft palate.—The premedication for an operation for repair of cleft palate consists of atropine or scopolamine, the dosage computed according to the patient's age, given three quarters of an hour before operation. Avertin (80 mg. per kilogram of body weight) is used as a basal anesthetic, followed by Vinethene if needed and finally ether given with a Yankauer mask. Anesthesia is maintained by the use of a Richardson bottle with ether and compressed air. A simple side-mouth hook was used routinely for a long time, but recently intratracheal intubation has been used with the Y or T tube.

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This method should always be used for older patients, especially those with receding chins, and also for patients who require secondary lip or palate repair.

Postoperatively, the patient is put in bed in the "T and A" position, i.e., on the abdomen with a sandbag under one side of the chest, the back hand at the side, and the presenting hand extended above the head. This position should be maintained until the patient's reflexes are active.

Cleft lip.—Anesthesia for the repair of cleft lip differs from that for the repair of cleft palate in that only atropine is given for premedication, no avertin being administered. When avertin was given, respiratory depression with pronounced cyanosis tended to occur. Since avertin has been omitted, this complication has been less frequent.

For induction a baby Yankauer mask is used with four layers of eight-mesh gauze; more than six layers should never be used. Vinethene-ether is the anesthetic of choice. Anesthesia is maintained by the use of a Richardson bottle with ether and compressed air. A rubber catheter is placed in the oropharynx and held with a stitch in the tongue. After the catheter is in position, the anesthetist's hand should be placed lightly on the abdomen for the duration of the entire operation. This is done to make certain that the catheter does not inadvertently slip into the esophageal opening to cause abdominal distention. When this happens, the pulse becomes weak and rapid, respirations become shallow, and the color becomes ashen; a Levine tube should be immediately inserted and the stomach deflated. All patients undergoing repair of cleft lip are kept under the observation of the anesthesia staff until their reflexes are active.

Burns.—Patients with burns present grave anesthesia problems. One often wonders at the time whether some of them will tolerate anesthesia, yet usually there is no alternative. When a large body surface is involved, the patient is in exquisite pain and extremely apprehensive. The fluid balance is also adversely affected. Cyclopropane, frequently supplemented with ether, is the anesthetic of choice, and it has been given to patients for weekly dressings over a long period with no untoward results.

ABDOMINAL SURGERY

Pyloric stenosis.—From birth a baby with pyloric stenosis has poor digestion and is usually dehydrated. Operation usually is performed during the first four to six weeks of life. Care must be taken during operation to help the baby maintain body heat and fluid. Before the operation begins, the arms and legs are wrapped in sheet wadding, and a warm, hot water bottle is placed under the cotton blanket upon which the baby lies during the operation. *Before* anesthesia is started, a Levine tube is inserted through the nose into the stomach, and aspiration performed. The tube is left in place during operation. Not only is this measure helpful to the surgeon, in that it is easier to deliver the stomach when it is empty, but most important it eliminates the possibility of vomiting and aspiration, a complication that has frequently been reported as a cause of death. In most of these instances of a

fatality a Levine tube was not used to aspirate the stomach contents. Vinethene-ether is used throughout the operation and is given with a baby Yankauer mask made up with four-layer gauze.

Perforated appendix.—A child with a perforated appendix enters the hospital in a precarious condition with a temperature sometimes as high as 105 F., pulse rate 180 a minute, and respiratory rate 40-50 a minute. The patient is also usually severely dehydrated. The feeling a few years ago was that the child should be rushed to the operating room and operated upon immediately under ether anesthesia. Often the temperature, pulse rate, and respiratory rate would increase, and convulsions would result. Then it would be nip and tuck as to the recovery. The treatment today is vastly different. The operation is postponed until the patient is prepared, and fluids, such as 5-10 per cent dextrose and water, are given intravenously to supply the tissues and to treat the acidotic condition. The patient is placed in an oxygen tent in which the concentration is high, and a Levine tube is inserted through the nose into the stomach to combat distention. Chemotherapy is started immediately. When the temperature and the pulse rate have decreased to within a reasonable range (temperature below 102 F.; pulse rate below 130 a minute; respiratory rate 28 a minute), operation is considered safe.

The premedication is atropine given subcutaneously three quarters of an hour before operation. For anesthesia a 2½ per cent solution of pentothal sodium is injected into the intravenous tubing near the needle. The requirement is usually not more than 5 or 6 cc., as the child is already drowsy from fever. Cyclopropane is then used for the maintenance of anesthesia. Under this management there have been no deaths or convulsions.

Intestinal obstruction.—For the newborn who is an extremely poor risk for anesthesia, inhalation anesthesia of any kind may be dangerous. If the intestines and abdomen are distended, there is pressure on the diaphragm and hence on the lungs. Pneumonia is often present to make anesthesia hazardous. Atropine, gr. 1/1,000 (0.065 mg.), is given three quarters of an hour preoperatively for medication. A Levine tube with occasional suction is used on all babies. A high concentration of oxygen is administered preoperatively and postoperatively. Cyclopropane is the anesthetic of choice, and these babies tolerate it well. Since the baby's tongue often sticks to the roof of the mouth to obstruct the airway, a small metal or rubber airway (oral) is inserted after the patient is asleep.

There are four types of risks with these patients:

1. A good risk baby is given open drop ether by the infant Yankauer mask with four layers of eight-mesh gauze. No more than two layers should be added to this at any time, because the heavy concentration of ether will cause the baby to stop breathing.

2. A fair risk baby is treated similarly to the child with a perforated appendix, except that pentothal sodium is not used.

3. A poor risk baby is anesthetized locally with novocain (2 per cent) and given a brandy-glucose nipple. The brandy-glu-

cose percentage varies with the risk: (a) a poor risk baby receives one part brandy with ten parts glucose; (b) a medium risk, one part brandy with eight parts glucose; (c) a fair risk, one part brandy with five parts glucose. Before the operation is started, 4-6 cc. of the brandy-glucose mixture is inserted through the gastric tube and the tube clamped for a few minutes. The clamp is then removed and the tube allowed to drain. The baby is then permitted to suck a brandy-glucose nipple. With this method the baby is quiet from the beginning of the procedure.

4. A very poor risk baby is operated upon under local anesthesia with 2 per cent novocain. The baby must be pinned down securely to eliminate wiggling as much as possible. The extremities of the baby are wrapped in sheet wadding to guard against a decrease in temperature. Small glass bottles are filled with warm water, wrapped in stockinet, and placed along the baby's sides and in the axillae and groin to help maintain the body heat.

Omphalocele (amniotic hernia).—Where there is an obstetric department in any general hospital, the anesthetist may be faced with the difficult problems that attend anesthesia for the repair of omphalocele. Because the operation is performed during the first few hours of life, incomplete expansion of the lungs may make it extremely difficult to establish anesthesia. A Levine tube is always inserted through the nose into the stomach before operation. Good relaxation is necessary as a large amount of intestine must be placed in a small abdominal cavity. Open drop ether is used with the infant Yankauer mask and four layers of gauze, more being added as necessary. Induction may take twenty minutes and sometimes longer. Not enough relaxation is obtained with cyclopropane alone, but it can be used with ether, which is added for the reduction of the omphalocele and closure of the peritoneum.

Bronchoscopy with Bronchography

This procedure is usually carried out as a diagnostic examination for pulmonary suppuration, bronchiectasis, a cyst or tumor, each condition in itself being of major consequence. Atropine or scopolamine three quarters of an hour before operation and avertin, 80-90 mg. per kilogram of body weight, twenty minutes before operation are recommended. Vinethene-ether by the open drop method is used with four, six, or eight layers of gauze according to the condition and the size of the patient. Avertin is not used for infants up to 1 year of age. Frequently, the patient will stop breathing for a short time when the bronchoscope is introduced, the condition usually being relieved by chest compression and the administration of oxygen. After bronchoscopy is performed, a rubber or plastic catheter is placed in the trachea through the mouth, and the patient is taken to the department of roentgenology. Here, lipiodol is injected through the catheter, and the roentgenograms are taken. The injection must necessarily be done hurriedly, and the patient may become cyanotic as the bronchioles are filled with heavy oil. As soon as the roentgenograms are finished, the patient is

placed on his side, and suction is applied to the catheter to try to clear the lungs of most of the lipiodol. Since the roentgenologist and all concerned dread a possible explosion in the presence of ether, the ether and ether mask are removed from the room, and the patient's nose and mouth are covered with wet towels while the roentgenograms are being taken. The most important feature of this entire procedure is to be certain that suction apparatus is kept by the bedside at all times during the immediate postoperative period: It is considered a lifesaving device.

NEUROSURGERY

Neurosurgical operations are long and tedious procedures since the anesthetist is unable to observe any of the long operation and hears only the murmuring voices of the operative team above.

The use of the Richardson bottle, with compressed air and oxygen, and an intratracheal tube (preferably the Magill or Portex tube) will keep equipment at a minimum and thereby keep the anesthetist out of the surgeons' way. The intratracheal tube is connected to a Y tube, one side for inhalation and the other for exhalation and the blowing off of carbon dioxide. No breathing bag is necessary with this method. In fact, a breathing bag that is filled with air or oxygen is heavy and may dislodge the intratracheal tube. Avertin (80 mg. per kilogram of body weight) is given to older children, this dosage being used to reduce to a minimum the amount of ether that is necessary and thereby to eliminate increased intracranial pressure caused from an abundance of ether. Whenever avertin is used as the basal anesthetic, scopolamine, the dosage being computed according to age and weight, is the only premedicant given. Vinethene-ether is administered to babies up to 1 year of age, with scopolamine given subcutaneously as the premedicant.

ESOPHAGEAL ATRESIA AND TRACHEOESOPHAGEAL FISTULA

Operations for esophageal atresia and tracheoesophageal fistula are truly a great challenge to the anesthetist. In years gone by every kind of anesthetic with every kind of device was tried. It wasn't until cyclopropane came to the fore and small equipment could be devised that we met with any success.

Before the diagnosis is made, the baby will invariably be fed and will gag, choke, and aspirate, the usual complication being pneumonia within a short time. Hence, the least irritating anesthetic should be used, and cyclopropane has been found to be the anesthetic of choice. For premedication atropine, gr. 1/1000 (0.065 mg.), is given three quarters of an hour before operation. Often this dosage is repeated because (1) these babies are prone to secrete large amounts of mucus; (2) the operation is long, and the effects of the atropine may wear off; (3) manipulations close to the esophagus and trachea may cause stimulation of the vagus nerve with resultant respiratory depression and bradycardia. Cyclopropane is given by the closed infant to-and-fro system to eliminate dead space. During the procedure the patient is on his left side. In order to ob-

tain adequate exposure three or four retractors are necessary, and frequently the pleura, which is tissue-paper thin, is torn during dissection. Intubation is carried out if the condition of the baby makes it necessary. For a short time intubation was used routinely, but this was discontinued when it was followed several times by laryngospasm. The babies are usually 3 to 5 days old when they undergo operation, the procedure lasting at least three hours. The following day gastrostomy is routinely established, usually under local anesthesia with 2 per cent novocain, and the baby is started on his feeding regimen through the temporary opening. Suction apparatus, laryngoscopes, and intratracheal tubes are kept by the bedside until all danger is past.

Orthopedic Surgery

Many children must undergo repeated orthopedic operations, and some method must be devised to eliminate fear. For premedication nembutal is given rectally two hours before operation, the dosage being computed according to age and weight. Morphine and atropine or scopolamine are given subcutaneously approximately one hour before operation.

As children dread a needle injection, nitrous oxide and oxygen are usually administered for induction. The intravenous administration of 5 per cent dextrose and water is then instituted, and at this time pentothal sodium (2½ per cent solution) is introduced with the use of a three-way stopcock. Intratracheal intubation is performed on all patients who must lie on the abdomen, and sand bags are used for support. For anesthesia for spinal fusion the Richardson bottle with ether, compressed air, and a Y tube is used.

Tonsillectomy and Adenoidectomy

Routine tonsillectomy and adenoidectomy can be quite a headache. A clinic patient is permitted to have a light breakfast at home and is admitted to the hospital by midmorning. The medication given is nembutal rectally and atropine or scopolamine subcutaneously three quarters of an hour before operation, the dosage being computed according to age and weight.

The patient is put into a modified Rose position using a Brown-Davies mouth gag with an ether attachment to the Richardson bottle and compressed air for the maintenance of anesthesia.

The postoperative position for children undergoing tonsillectomy and adenoidectomy has been described heretofore. If there should be postoperative bleeding, it is more quickly and easily detected with the patient in this position.

Mastoidectomy

The preoperative medication most frequently used is nembutal given rectally, the dosage being computed according to age and weight, atropine or scopolamine, and morphine given subcutaneously. When avertin is used, atropine or scopolamine alone is given as a premedicant. Vinethene-ether is the anesthetic used for most small children, while nitrous oxide-oxygen for induction is used for older chil-

dren. For maintenance of anesthesia a Richardson bottle is employed using compressed air and ether. Intubation is performed on these patients with the intratracheal tube connected to a Y tube.

SPLENECTOMY AND NEPHRECTOMY

Patients having kidney operations are put on the right or the left side, as the indication may be, while those undergoing splenectomy are put into position on the right side.

A Levine tube and intratracheal intubation are used for both procedures. If the patient is sufficiently large, the gas machine is used with nitrous oxide-oxygen-ether induction. Oxygen-ether is used for maintenance of anesthesia. For most operations a continuous intravenous drip is started after the patient is asleep, by feeding a cannula or small polythene tubing into the vein. This has proved to be a lifesaving procedure in many instances. If the intravenous infusion is started under local anesthesia, the patient, although sufficiently medicated, may become excited, and the desired level of anesthesia may be difficult to maintain throughout the operative procedure. It is more satisfactory for all concerned if the patient is put to sleep before the intravenous cannula is inserted.

PREOPERATIVE MEDICATION

No baby under 1 year of age is ever given a sedative preoperatively. The vital capacity of a newborn is minute, the tidal volume for the first few days of life being approximately 20 cc. Sedatives so depress respiration that apnea frequently occurs. The premedication of choice for the newborn is a minimal dose of atropine (0.065 mg., or gr. 1/1,000). To a baby 6 to 8 months of age, atropine, 0.09 mg., or gr. 1/750, is administered and to a baby 1 year of age, 0.13 mg., or gr. 1/500. Morphine is usually not given to babies under 1 year of age, but if a baby is robust and well developed, a minimal dose may be given with safety.

PRELIMINARY VISIT

In the late afternoon the operative schedule for the next day is prepared. A preliminary visit is then made to all patients who are to be operated upon the next day. Perhaps the patient is too young to be told of the details of the anesthesia, but if the family is visiting the child, the anesthetist has a chance to become acquainted with them as well as the patient. The chart is read, the condition of the heart and lungs is checked, and any untoward complications are noted. By this means the anesthetist is given a good knowledge of the condition, what to expect, and the anesthesia technic that should be used. We find this visit of great value. In years past the mother and father of a private patient were allowed to go to the operating room with the child and to stand by in the anesthesia room while the patient was being put to sleep. Under this system tension was accelerated just when it should have been at its lowest ebb. This procedure has been entirely eliminated, and we find that the patient will co-operate much more readily if the parents are not with him. The operating room is not a place for visitors.

POSTOPERATIVE VISITS

A daily visit is made to all patients postoperatively for the first five days, temperature, pulse, respiration, and blood pressure being noted. Also noted are voiding, distention, and any untoward complication, and all these findings are recorded on the back of a duplicate anesthesia sheet. Once a month the anesthetists hold a "complication meeting" at which the complications are reviewed and talked over with the chief anesthesiologist. In this way helpful suggestions are made. Operative and postoperative deaths are discussed at this meeting, and a great deal is learned about complications and how to avoid them and about resuscitative methods, of which little was known a few years ago. We believe that the two most important supportive measures in any operation are: (1) a continuous intravenous infusion of blood in the operating room for all complicated and difficult cases and an ordinary intravenous infusion for other elective operations, and (2) the administration of plenty of oxygen.

At one end of the operating suite there is a pleasant waiting room, which also serves as a recovery room. At the end of the morning those patients who have undergone long procedures are put into this room for the recovery period. When a patient has been through a long operation, such as a cardiac or thoracic operation, he is left on the operating table until the pulse, respiration, and blood pressure are stable. A well equipped recovery room is a *must* in any hospital, since it enables the anesthetist to keep an eye on the patient during the immediate postoperative period when emergencies are prone to arise. Also, with this method, the wards are not cluttered with postoperative patients who are likely to be vomiting and noisy to the discomfort of the other patients.

INDICATIONS FOR INTRATRACHEAL ANESTHESIA

Intratracheal anesthesia is indicated in the following operations:

1. *Operations about the mouth, face, or neck.*—The usual mask technic interferes with the work of the surgeon; whereas the insertion of an intratracheal tube allows distant control by the anesthetist and also permits packing to prevent blood or other material from passing into the trachea. These indications include: (a) plastic surgery about the face, (b) dental procedures, (c) excision of tumors of the face or mouth, (d) excision of branchiogenic or thyroglossal cysts, (e) operation for torticollis, (f) eye operations, and (g) crowing respirations.

2. *Operations upon patients in the prone position.*—The face-down position interferes with a clear airway, and anesthesia is difficult to control without intubation. These procedures include: (a) brain surgery, (b) laminectomy, (c) spinal fusion, and (d) operations upon the back.

3. *In thoracic surgery,* it is necessary to use positive pressure to avoid pulmonary collapse or mediastinal flutter. Positive pressure is most effectively maintained by the use of the intratracheal technic. These procedures include: (a) lobectomy, pneumonectomy, or thoracoplasty, (b)

TABLE 1.—APPROXIMATE SIZES OF LARYNGEAL TUBES FOR CHILDREN OF VARIOUS WEIGHTS AND AGES

TYPE OF TUBE	AGE								
	Newborn		6 mo.	1 yr.	2 yr.	4 yr.	6 yr.	8 yr.	10 yr.	12 yr.
	Under 5 lb.	7 lb.								
Polythene 10-12 gage										
King (Magill)		00-0	19	21	24	25	26	27	27	27
Portex			1	2	2	3	4	4	5	6

The sizes are approximate. A tube should be used that will fit the glottis tightly and that will pass through the cords easily.

surgery of the heart and great vessels: (1) division of patent ductus arteriosus, (2) excision of coarctation of the aorta, (3) operation for tetralogy of Fallot, (4) division of vascular ring, and (5) valvulotomy.

4. *Resuscitation.*—Drug overdosage usually results in severe respiratory depression and often death. Resuscitation is most adequately performed by intratracheal intubation and the clearing of the airway of foreign material by suction, followed by rhythmic expansion of the lungs by oxygen under pressure. Similar resuscitation may be necessary in cases of (a) drowning, (b) poisoning, (c) intracranial hemorrhage, and (d) bulbar poliomyelitis.

5. *Anesthesia for patients with full stomachs.*—Anesthesia for these patients has been described under the section on anesthesia for minor procedures.

EMERGENCY TABLE

An emergency table, consisting of a cabinet on wheels, has helped in a great many emergencies in the last three years. Before this cabinet was devised, the equipment was scattered in several different places making it difficult for anyone outside of the department to find things in a hurry. Now everything that might be needed in an emergency is kept in this cabinet, and one need only call for the emergency table.

The cabinet consists of four drawers, each 22 inches wide and 15 inches from front to rear. The first three drawers are only 3 inches in depth, and in them the intratracheal equipment may be spread out in full view. This is quite helpful, since many times the choice of the proper sized intratracheal tube must be made while the larynx is held in view. The tubes are laid out according to size and vary from no. 8 French through no. 30. These tubes are of the soft rubber variety and are made from ordinary catheters or Magill tubes. Soft catheters are preferable in pediatric anesthesia. These tubes are kept sterile in the drawer. The second drawer contains laryngoscopes and the various coupling devices. Four types of laryngoscopes have been found to meet our needs: the infant MacIntosh, infant Miller, Wis-Foregger, and the adult Guedel. The third drawer contains a second assortment of intratracheal tubes, which are of the woven type and are less fre-

TABLE 2.—MORTALITY RATES AT THE CHILDREN'S MEDICAL CENTER, BOSTON

YEAR	OPERATIONS	DEATHS	MORTALITY %
1947	5,221	50	0.95
1948	5,545	67	1.21
1949	5,126	59	1.15
1950	5,741	70	1.21

quently used. They are preferable in operations where excessive secretions or pus may be found in the respiratory tree, as they afford ready passage of suction tubes. The fourth drawer is 5 inches deep and contains the bronchoscopy equipment used in less common emergencies. Numbers 4-5 and 9 mm. bronchoscopes with appropriate lights and suction tubes are provided. In this drawer there is room for battery boxes and light cords as well as for ampules of procaine and pentothal sodium and sterile syringes. This entire cabinet can be easily transferred to any part of the hospital where an emergency might occur. Great improvements in intratracheal technic and resuscitation have been made since this cabinet was devised, and it is strongly recommended as a standard piece of equipment in any anesthesia department.[1]

SUMMARY

The simple methods and the equipment described for pediatric anesthesia have been found to be safe for the patient and to be convenient for the surgeon.

1. Smith, R. M., and Lank, B. E.: An endotracheal and bronchoscope cabinet for pediatric anesthesia. Anesthesiology 9:88-91, Jan. 1948.

My Gift

To the Agatha Hodgins Educational *Loan* Fund

I hereby donate $_____to the Agatha Hodgins Educational Fund, which is "designed to extend financial assistance to graduate nurse anesthetists in obtaining further education and training to become qualified instructors, or to instructors who desire and need additional training to become better qualified."

Name_____

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(Checks should be made payable to: American Association of Nurse Anesthetists, for Educational Fund, and sent to: American Association of Nurse Anesthetists, 116 S. Michigan Ave., Chicago 3, Illinois.)

CLINICAL USE OF PROCAINE ADMINISTERED INTRAVENOUSLY

David J. Graubard, M.D.*
New York City

It is almost fifty years since Einhorn[1] first synthesized procaine. During that time its use has been praised, condemned, tolerated, and finally recognized as of definite therapeutic value in the treatment of certain clinical entities. This recognition is the result of our increased knowledge of the physiology and the pharmacologic properties of procaine, which, when evaluated properly, enables us to determine which disease processes would be most likely to respond favorably to intravenous procaine therapy.

REGIONAL ANESTHESIA

August Bier[2] was the first to produce regional anesthesia of an extremity by procaine administered intravenously. His technic with only minor modifications made by later surgeons and anesthetists is in general use today.

Basically, the procedure is limited to an extremity. The limb to be anesthetized is elevated in order to deplete the blood supply as much as possible. An Esmarch bandage is then wound spirally from the toes or fingers to at least 5 cm. above the site of operation. A second Esmarch bandage is then applied from the distal portion of the extremity over the first until it is more proximal. This second Esmarch bandage, which acts as a broad tourniquet, should never be applied over a joint. The first Esmarch bandage is then removed, and a third Esmarch bandage is applied distal to the site of operation. This produces a restriction of the arterial and venous circulation both above and below the site of operation.

After the area between the bandages has been treated with antiseptic solution, a superficial vein is chosen, and a wheal is made about it with 0.5 per cent procaine solution. A 0.5 per cent solution of procaine hydrochloride in physiologic saline is used for the intravenous injection. The amount required varies: for an arm 30 to 50 cc., for a leg 60 to 100 cc. Complete anesthesia distal to the proximal bandage is usually obtained in seven to ten minutes. As soon as anesthesia is complete, the distal bandage is removed. At the completion of operation removal of the proximal bandage is followed by a return of sensibility in two to seven minutes.

Read before the Seventeenth Annual Meeting of the American Association of Nurse Anesthetists, Atlantic City, September 20, 1950.

*Adjunct Visiting Surgeon, Beth David Hospital.

1. Graubard, D. J., and Peterson, M. C.,: *Clinical Uses of Intravenous Procaine* (Springfield, Ill.: Charles C Thomas, Publisher, 1950) p. 4.

2. Bier, A.: Ueber eine neue Methods der lokalen Anasthesia. München med. Wchnschr. 1:589, 1909.

The indications for this method are: (1) in emergency operations where shock may be anticipated; (2) when general or spinal anesthesia is too difficult to produce; and (3) when local anesthesia is inadequate.

It is contraindicated in aged patients with advanced arterial disease, in patients suffering from diabetic or senile gangrene, or when an infectious process is near the site of injection.

INTRAVENOUS PROCAINE AS AN ADJUVANT TO GENERAL ANESTHESIA

The more intricate intrathoracic operations performed today were not risked up to a few years ago because of the severe cardiac disturbances that often confronted the surgeon as a result of the operation itself and the various anesthetic agents used. The cardiac arrhythmias may be caused by direct stimulation of cardiac tissue (pericardium as well as myocardium), the anesthetic agent used (chloroform, ether, ethyl chloride, or cyclopropane), apprehension of the patient, or even the presence of small amounts of circulating epinephrine.[3]

Burstein[4-6] in several excellent reports demonstrated that the cardiac arrhythmias produced by epinephrine during cyclopropane anesthesia can be prevented by procaine administered intravenously. His method utilizes an intravenous dose of 50 to 100 mg. in 1 per cent solution, or 5 to 10 cc. This is repeated in five minutes if the first dose is ineffective. Noble[7] stated that procaine given intravenously may be useful in the management of total cardiac failure.

Fraser[8] found that the combination of pentothal sodium and procaine hydrochloride not only was effective as an analgesic agent but also aided in the prevention of cardiac dysrhythmias. His occasional use of a 1 per cent solution of procaine in addition to a low dilution (0.1 per cent) drip sometimes produced a preconvulsive state of procaine toxicity, of which tetany is one of the signs. When the dilute solution, 0.1 per cent, was used, these reactions were not encountered.

The excellent results reported by Bittrich and Powers[9] in the use of procaine as an adjuvant in intrathoracic cases prompted Taylor and his associates[10] to investigate procaine administered intravenously in conjunction with pentothal sodium, curare, cocaine applied topically, and cyclopropane, separately and in combination. Their technic was fairly consistent. A 1 per cent procaine hydrochloride solution was prepared by dissolving 5 Gm. sterile procaine crystals in 500 cc. of 5 per cent glucose solution.

3. Graubard, D. J.: loc.cit., p. 46.
4. Burstein, C. L.; Marangoni, B. A.; DeGraff, A. C., and Rovenstine, E. A.: Laboratory studies on the prophylaxis and treatment of ventricular fibrillation induced by epinephrine during cyclopropane anesthesia. Anesthesiology 1:167-186, Sept. 1940.
5. Burstein, C. L.: Treatment of acute arrhythmias during anesthesia by intravenous procaine. Anesthesiology 7:113-121, March 1946.
6. Burstein, C. L., and Rovenstine, E. A.: Aids in thoracic surgery. New York State J. Med. 46:2142-2146, Oct. 1, 1946.
7. Noble, A. B.: Anesthetic emergencies. Canad. M.A.J. 56:490-496, May 1947.
8. Fraser, R. J.: Intravenous pentothal procaine analgesia. Anesth. & Analg. 27:159-163, May 1948.
9. Bittrich, N. M., and Powers, W. F.: Intravenous procaine in thoracic surgery. Anesth. & Analg. 27:181-196, July 1948.
10. Taylor, I. B.; Stearns, A. B.; Kurtz, H. C.; Henderson, J. C.; Sigler, L. E., and Nolte, E. C.; Intravenous procaine—an adjuvant to general anesthesia: a preliminary report. Anesthesiology 11:185-198, March 1950.

Standard intravenous equipment with a dropper was used. After induction of anesthesia administration of the procaine solution was started at about 4 cc. of 1 per cent solution (40 mg.) per minute. This rate was for the average adult. Slower rates were used for children and older and poor risk patients. Here the number of drops per cubic centimeter must be determined before administration. Frequent blood pressure determinations must be made to detect circulatory depression. Two hundred and eleven administrations of procaine were given. These workers made some definite observations concerning the effects of the use of procaine as described: depression of the cough reflex; sweating; salivation; prevention of cardiac arrhythmias during cyclopropane anesthesia for intrathoracic operations; a quiet, calm, and rapid recovery from anesthesia; postoperative analgesia lasting as long as several hours; and finally the maintenance of light anesthesia when procaine is used in combination with any general anesthetic drug.

INTRAVENOUS PROCAINE FOR THE MANAGEMENT OF PAIN

So far the discussion has been limited to the use of procaine as a regional anesthetic and as an adjuvant to general anesthesia. Another phase is its use as an analgesic alone.

For the past forty years pain has been studied intensively. Much has been written about it, and it is difficult to say much that is new. The conquest of pain is an important task whether at the bedside, in the operating room, or on the battlefield.[11] My associates and I have recognized that some of the factors involved in the production of pain are involvement of the autonomic nervous system, vascular changes, and metabolic imbalance.[12] The interrelation of these factors is so close that the control of one of them usually produces a satisfactory response. Sarnoff and Arrowood[13] demonstrated that low concentrations of procaine will affect the sympathetic fibers only. When the sympathetic fibers are no longer stimulated, vasospasm decreases, and eventually metabolites are removed from the area of pain. In a previous report we postulated that the pronounced improvement noted in many cases was due to the action of procaine.[14] Bergmann[15] proved experimentally that one of the sites of action of procaine is the sympathetic ganglion.

In over 7,000 infusions given to more than 1,000 patients we have not altered our method of administration. The solution used is a commercially prepared solution of 1:1,000 (0.1 per cent) procaine hydrochloride in physiologic saline.* To this solution we add sufficient ascorbic acid, or vitamin C, to make a 0.1 per cent

*a. Procaine Hydrochloride, 0.1 per cent, in Isotonic Sodium Chloride Solution, Abbott Laboratories, North Chicago, Ill.
b. Novocain, 1:1,000, in Isotonic Sodium Chloride Solution, Winthrop-Stearns, Inc., New York City.

11. Medvei, V. C.: *The Mental and Physical Effects of Pain* (Edinburgh: E. & S. Livingstone, Ltd., 1949).
12. Graubard, D. J., and Ritter, H. A.: Intravenous procaine in the treatment of trauma; preliminary study. Am. J. Surg. **74**:765-769, Nov. 1947.
13. Sarnoff, S. J., and Arrowood, J. G.: Differential spinal block; a preliminary report. Surgery **20**:150-159, July 1946.
14. Graubard, D. J.; Waldman, M. H., and Peterson, M. C.: Intravenous procaine in the management of the injured hand. New York State J. Med. **48**:1693-1698, Aug. 1948.
15. Bergmann, F.: Personal communication to the author.

solution. Ascorbic acid, or vitamin C, has a double function: (1) to decrease the toxicity of procaine[16] and (2) to increase the vitamin C content of the patient. In passing it may be stated that in the cases of our patients we have discovered subclinical avitaminosis, especially vitamin C.[17]

The solution is administered through an infusion set, into which is incorporated a "Flowrater," an instrument that accurately measures the rate of flow.[18] The marked inaccuracies of the various types of drips have been demonstrated.[19] The use of a "Flowrater" allows for greater accuracy (an error factor of less than ½ of 1 per cent).

All infusions are given according to the "procaine unit," i.e., 4 mg. procaine per kilogram of body weight in twenty minutes. For example, an individual weighing 70 Kg. (154 lb.) would receive 280 mg. procaine, or 280 cc. of the 0.1 per cent solution in twenty minutes, or 14 cc. a minute for twenty minutes.

None of our patients is given barbiturates for premedication or is required to fast prior to an infusion. Our routine is to allow the patient to recline on a treatment table or bed for several minutes, to give the infusion for twenty minutes at the predetermined dosage, and then to allow the patient to rest for ten to fifteen minutes after the infusion.

The patient should be informed that the arm in which the infusion is being given will feel colder and perhaps heavier than the other arm, that a sensation of warmth may ensue, that mild drowsiness and perhaps giddiness may develop, and that increased salivation and lacrimation may occur. All these symptoms disappear during the postinfusion rest period. Occasionally, increased peristalsis is noted.

Our youngest patient was 22 months of age, and our oldest patient 94 years of age. In our experience the contraindications are myasthenia gravis and digitalization. The indications for the use of procaine intravenously in cardiac conditions will be discussed in a future report.

The clinical entities for which procaine administered intravenously has been beneficial have been elaborated upon in a recent publication.[1] Briefly, it has been successful in the treatment of pruritus, serum sickness, and allergic manifestations. It also has a definite place in the treatment of trauma. Sufficient clinical and statistical data are available to make this procedure the method of choice for relief of pain in burns, postoperative conditions, fractures, dislocations, and causalgia.

One of its outstanding uses is for the management of pain in arthritis. A recent report covering this condition in detail noted that more than 80 per cent of the patients obtained good results.[20] The

(Continued on page 97)

16. Richards, R. K.: Effects of vitamin C deficiency and starvation upon the toxicity of procaine. Anesth. & Analg. **26**:22-29, Jan.-Feb. 1947.

17. Graubard, D. J., and Peterson, M. C.: Intravenous procaine in the management of arthritis. Conn. State M.J. **13**:33-36, 1949.

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1. Graubard, D. J., and Peterson, M. C.: loc.cit.

20. Graubard, D. J., and Peterson, M. C.: Intravenous use of procaine in the management of arthritis. J.A.M.A. **141**:756-761, Nov. 12, 1949.

ANESTHESIA FOR OBSTETRICS

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Columbus, Ohio

Obstetric anesthesia stands in a class by itself. Instead of one, there are two lives to be considered. The anesthetist and the obstetrician often do not have the opportunity to discuss any idiosyncrasies of the patient, premedication, and the operating to be done. The anesthetist rarely sees the patient to talk with her. Usually, by the time this is possible, the patient has been given premedication and is unable to talk coherently.

The comfort of the child is as important as that of the mother. Just how long analgesia should be given during the last stages of labor, when the pains are almost unbearable, is frequently up to the anesthetist to decide. The safety of the mother and child must be uppermost in the minds of all delivery room personnel.

At one time it was thought that any person who seemed to be around could "pour a little ether." It made no difference whether the anesthesia was smooth, or how much difficulty was encountered; if the baby cried spontaneously, things were satisfactory. The equipment and apparatus were old, usually handed down from the operating rooms. Today in most up-to-date hospitals the picture is different. Graduate anesthetists of recognized schools are employed at specified working hours, the delivery rooms are separate departments, and the equipment is in good working order.

ANESTHETIC AGENTS

Pentothal sodium.—Pentothal sodium has been used with great success in obstetric anesthesia. I always give oxygen with pentothal sodium and insist that the cord be cut as soon as the baby is born. The jaw of the mother is supported. There must be no delay on the part of the personnel, in order that the anesthetic be given for the shortest possible time, and that at the same time, the obstetrician may be able to do whatever procedure is necessary. I have used pentothal sodium for a considerable length of time and have experienced no untoward results. The baby is not depressed and always cries immediately. A 5 per cent solution is used, and never more than 1 Gm., which is seldom necessary, is given. The patient awakens quickly, is well oriented, and is able to take a little nourishment. There is no nausea. The same premedication is given as for other types of anesthesia. However, pentothal sodium is not the anesthetic of choice if the obstetrician works slowly. In the event of a breech delivery, use of axis traction for-

ceps, or other extensive work approximately 2 cc. of curare is given to relax the perineum, after which pentothal sodium is administered. The administration of pentothal sodium is never started until the patient is prepared and draped.

Nitrous oxide and oxygen.—While this combination provides very pleasant anesthesia, it does not produce enough relaxation and causes respiratory depression in the baby, especially when it is given after large doses of sedatives. This combination is satisfactory for a multipara who has been delivered of several children and who requires only a minimal amount of anesthesia for delivery. For a primipara or any patient who is to undergo episiotomy or a long procedure, ether must be added to the mixture for relaxation, or drop ether may be given. Enough oxygen must always be given to insure an adequate supply to the child. At no time is a patient permitted to become cyanotic, have a rapid pulse, or present signs and symptoms of too deep anesthesia. Immediately after delivery, while the cord is still pulsating, pure oxygen is given to benefit the baby. As little ether is used as is possible, as it tends to relax the uterus and increase bleeding. The patient must be completely relaxed for high forceps, version, axis traction, or breech delivery. While the repair is being done the anesthesia may be very light.

Chloroform.—This agent has been replaced by safer anesthetics of less toxicity.

Caudal anesthesia and regional anesthesia are used in certain types of cases.

Local anesthesia.—This is not used very often. It is simple to use and harmless to the fetus. There are no contraindications. It may be used in cases of toxemia and does not interfere with the initial respiration of the baby. However, it is not an ideal type of anesthesia for a nervous, high strung patient or for use in a busy delivery room where there are loud talking and noise and unwise remarks are often made. This can make a lasting impression on a patient.

Spinal anesthesia.—In our hospital spinal anesthesia is used only when a patient requests it and occasionally for the delivery of premature babies.

Scopolamine.—Frequently, a patient is brought into the hospital ready for delivery, and there is no time for routine preparation or sedation. The food the patient has eaten has not been digested. Scopolamine, gr. 1/100, is given by the intravenous route. It acts quickly, lessens secretions, and prevents probable laryngospasm.

PREMEDICATION

A person can easily bear the discomfort of most of the first stage of labor. The inhalation agents may be given for a few moments for relief of a labor pain. The patient can aid the progress of the labor by her own voluntary efforts more effectively if the pains are relieved to some degree. The administration of the anesthetic may be started at the end of the first stage, when the head in passing through the cervical ring causes intense pain, and may be given intermittently throughout the second stage. If it is desired that a too rapid progress of the child be restrained, the anes-

thesia is deepened and pains cease.

The administration of drugs presents certain disadvantages. For the child the possibility of respiratory depression is increased and therefore the likelihood of atelectasis. Personnel must be available for resuscitation and careful observation, and the use of premedication is more practical in hospitals than in homes. A completely painless labor cannot be attained with safety for both mother and child. It is now generally believed to be advisable to provide analgesia for the duration of labor and leave the patient conscious but placid between pains. Prolonged periods of seminarcosis have been proved to be detrimental to both mother and child. Actual anesthesia is preferred from the time the delivery is taking place to the time the placenta is expressed. The medication used should not reduce the force of the uterine contractions or have toxic effects on mother and baby.

Premedication is never given until labor has been well established. Demerol, 100 mg., and scopolamine, gr. 1/100, at the present time seem to be popular. These drugs in combination with nembutal, seconal, sodium amytal, or occasionally sodium allurate constitute an ideal analgesia. However, there is no standardized combination or routine method. The choice depends on the wishes of the individual physician. The safety of both mother and child is of great importance, and the progress of labor must not be hindered, although occasionally this effect is not discovered until after the drug is given. Sufficient personnel must be on duty to watch the patient, who is under the influence of the drugs. The bed should be equipped with sideboards to prevent the patient from falling out of bed.

The obstetric patient looks forward to the mysterious ordeal of labor for months with growing anxiety and fear. Before the anesthetic is given, she should be given assurance of a successful outcome.

PROCAINE

(Continued from page 94)

conclusions were that the intravenous infusion of procaine hydrochloride for the management of pain in arthritic conditions is a safe procedure, provided the administration is controlled, and that the control of pain is sufficient to warrant its use as an adjuvant in the treatment of arthritis.

Other uses of the intravenous administration of procaine have been studied in a preliminary way with encouraging results. Acute poliomyelitis, embolism, anuria, frostbite, asthma, transfusion reaction, and eclampsia are but a few of the many clinical conditions that respond to the administration of procaine intravenously, and a recent report mentioned the excellent results obtained in carbon monoxide poisoning.[21]

SUMMARY

As time goes on and the use of procaine intravenously increases, we will find that its place in medicine will be justified not only for its use as an anesthetic, adjuvant to anesthesia, or analgesic but also for its help in rehabilitation of the disabled.

21. Amyes, E. W.; Ray, J. W., and Brockman, N. W.: Carbon monoxide anoxia. J.A.M.A. 142:1054-1058, 1950.

GENERAL ANESTHESIA FOR RECONSTRUCTIVE SURGERY ABOUT THE HEAD AND NECK

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New York City

Many plastic surgical procedures about the head and neck can be performed under infiltration or block anesthesia to the mutual benefit of patient and surgeon. In certain cases, however, the location and type of operation or the psychologic state of the patient makes it necessary to employ some form of general anesthesia.

A successful end result in reparative surgery about the head and neck depends on the conditions under which the surgeon must work as well as on his technical skill. No surgeon can be expected to attain the maximal degree of perfection in a patient who is coughing, sneezing, or retching at intervals throughout the procedure. Similarly, apparatus that partially conceals the operative field, causes distortion of the features, or limits the motion of the head should be avoided. Adequate oxygenation and quiet respiratory activity depend upon the maintenance of a free airway. Special attention must be paid to the selection of an anesthetic agent that will produce the minimal physiologic disturbance in each individual patient in order to avoid a high morbidity in a group of patients frequently subjected to prolonged operative procedures.

Read before the Seventeenth Annual Meeting of the American Association of Nurse Anesthetists, Atlantic City, September 18, 1950.
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Anesthesia for Infants and Children

Although the basic requirements for good general anesthesia for plastic surgery about the head and neck are the same for all ages, certain factors have a greater significance in infants and children than in the adult patient.

The deleterious effects produced in children by carbon dioxide excess, heat retention, and increased resistance in the anesthesia circuit are familiar to all anesthetists. Therefore, the types of apparatus employed in this age group have been designed to avoid large dead spaces and complicated valvular systems. The majority also make use of the principle of a constant flow of large volumes of cool gases to insure adequate flushing of the alveolar spaces.

The technics of insufflation and no rebreathing described in the following paragraphs provide satisfactory general anesthesia for all types of reconstructive surgery in infants and young children.

Insufflation technics.—The basic principle underlying any insufflation technic is the vaporization of a liquid anesthetic agent, such as ethyl ether, by blowing air or oxygen over or through the drug. The mixture of anesthetic vapor and diluent is delivered into the pharynx of the patient by means of a single or double nasal catheter, a metal mouth hook, or a

Water's airway with insufflation nipple. Although this method requires a minimum of equipment and possesses the additional advantages of excellent carbon dioxide elimination and maintenance of a normal body temperature, its disadvantages are so numerous that it is advisable to limit its use to simple procedures of short duration.

The necessity of keeping the anesthetist's hands out of the operative field makes it difficult at times to maintain a free airway with insufflation technics. The situation may be further complicated by laryngospasm induced by a rapid or concentrated flow of irritating vapors. Another hazard is accidental overdistention of the stomach by inadvertent passage of large quantities of the gaseous mixture into the esophagus. The method is also wasteful of anesthetic agents and allows the escape of explosive mixtures into the operating room.

No-rebreathing technics.—Many of these disadvantages are eliminated by the use of Ayre's or Digby Leigh's no-rebreathing technic with intratracheal intubation.[1] In both methods the patient is anesthetized by the open drop, semiclosed, or closed technic prior to the introduction of a nasal or oral intratracheal tube. The tube is then connected to the Ayre's Y or T tube or the Digby Leigh valve.

Ayre's apparatus consists of a glass or metal Y or T tube attached to the intratracheal tube by a short piece of rubber tubing and a metal connection. Gases from the anesthesia machine or ether vaporizer are delivered to one of the arms of the Y through a long piece of rubber tubing. The other arm remains open to permit the escape of exhaled gases.

A cylindrical piece of metal equipped with two valves is the distinguishing feature of Digby Leigh's apparatus. One valve opens during inspiration and closes again as soon as this phase of the respiratory cycle is completed. The other valve functions in a similar manner for expiration. The cephalad part of the metal cylinder is connected to the intratracheal tube by a short rubber tube as in Ayre's technic. The distal end (in close proximity to the inhalation valve) is provided with a collapsible rubber bag, the tail of which is attached to the anesthesia machine by a long piece of rubber tubing. In order to keep the bag partially inflated, it is necessary to maintain a large flow of anesthetic gases throughout the operation.

Artifical respiration is easily established by intermittent occlusion of the free arm of the Y in Ayre's technic or by rhythmic compression of the breathing bag of the Digby Leigh apparatus with simultaneous closure of the exhalation valve.

The no-rebreathing technics that have been described contain the essential features of anesthesia equipment for infants and children and have the additional advantage of bringing about rapid elimination of the alveolar nitrogen, thus facilitating the administration of the weaker anesthetic agents, such as nitrous oxide, and reducing the required amounts of the more potent drugs.

Although Digby Leigh's and Ayre's technics are wasteful of gases, the main objection to their

1. Leigh, M.D., and Belton, M.K.: *Pediatric Anesthesia* (New York: The Macmillan Co., 1948).

use is the necessity for intratracheal intubation. The advantages of this procedure are obvious, but its hazards are frequently minimized. Successful intubation, especially in a patient with a deformity of the face, such as cleft palate or harelip, demands considerable technical skill. Since the trachea of an infant is comparatively short, care must be taken to avoid intrabronchial intubation with resultant atelectasis. Respiratory obstruction from postintubation laryngeal edema is more common in infants and children than in adults. Therefore, cuffed tubes are not employed in this age group, and the patients are kept under constant surveillance in the immediate postoperative period to detect any evidence of respiratory distress.

Anesthesia for older children.—The majority of children above the age of ten can be safely anesthetized with the equipment described in the section dealing with anesthesia for adults. For older children, however, inhalation agents are employed instead of pentothal sodium, and the release valves on the Y-shaped catheter adaptor and the anesthesia machine are kept open to permit a larger flow of gases than is customary for the older age groups.

Preoperative sedation.—The problem of preoperative sedation is an important one. A child who is sobbing and frightened before anesthesia will frequently continue to display irregular, jerky respirations throughout the operative period. Excess mucus may also constitute an annoying factor in these patients.

In the average healthy child there are few contraindications to the use of rectal analgesia with avertin or pentothal sodium except prolongation of the recovery period. On the other hand, adequate oral and hypodermic medication provides excellent sedation with a minimum of time-consuming effort. The most satisfactory results at Memorial Hospital have been obtained with a combination of morphine or demerol and scopolamine with nembutal or seconal, administered one to one and one-quarter hours prior to operation in the dosages recommended by Leigh and Belton.[2]

ANESTHESIA FOR ADULT PATIENTS

Many of the problems formerly associated with the administration of general anesthesia to adult patients undergoing reconstructive surgery about the head and neck have been solved with the use of pentothal sodium.

Technic of anesthesia.—After experience with several thousand cases at Memorial Hospital a technic has been evolved that has proved satisfactory under the most exacting circumstances. Since this method has been described in detail in previous publications,[3-4] only a brief review will be given here.

Preoperative medication consists of morphine or demerol and scopolamine, in doses compatible with the age and physical state of the patient, administered by the subcutaneous route one to one and one-half hours before operation. A patient scheduled for surgery in the late morning or afternoon is given an oral dose of nembutal or seconal at 7:00 a.m. to reduce

2. Ibid.
3. Schweizer, O.: Pentothal sodium anesthesia for operations about the head and neck. Cancer 2: 223-243, 1949.
4. Schweizer, O.: The use of pentothal sodium anesthesia in surgery about the head and neck. J. Am. A. Nurse Anesthetists 17: 325-330, Nov. 1949.

the apprehension engendered by the long interval between the time of awakening and the hour of operation.

When the patient arrives in the operating room, the pharynx, larynx, and nasal passages are sprayed with a 5 per cent solution of cocaine hydrochloride. The topical application of this local anesthetic agent serves a double purpose: (1) a reduction in the incidence of laryngospasm and (2) a diminished susceptibility to sneezing and other undesirable sequelae produced by stimulation of the trigeminal nerve endings.

After the preliminary cocainization has been completed, anesthesia is induced and maintained with a 2.5 per cent solution of pentothal sodium. A three-way stopcock attached to the syringe containing the barbiturate facilitates the administration of fluids and blood.

Nasal or oral intratracheal intubation is the most essential part of this technic, since it maintains an adequate airway and reduces the equipment in the operative field to a minimum. In the majority of cases intubation is readily performed under direct vision after the patient has been anesthetized with pentothal sodium. Relaxation of the facial muscles is obtained by the intravenous injection of 80-100 units of *d*-tubocurarine chloride.*

A short piece of firm wide bore rubber tubing connects the intratracheal tube to a Y-shaped catheter adaptor, which, in turn, is attached to the breathing tubes of the anesthesia machine. Since the catheter adaptor can be pinned to the head drapes in any desired position, there is neither restriction of movement of this structure nor interference with the manipulations of the surgeon.

Patients who present such marked facial deformities that intratracheal intubation becomes a technical impossibility are subjected to a preliminary tracheostomy. The tracheostomy tube is provided with a special fitting made from the inner tube of a tracheostomy tube of a size comparable with that in use in the patient. A piece of large bore plastic tubing approximately 18 inches in length connects this fitting to the Y-shaped catheter adaptor.

Many patients who have had extensive reconstructive procedures about the head and neck are unable to maintain an adequate airway while still under the influence of pentothal sodium anesthesia. Therefore, the intratracheal tube is routinely left in place until consciousness has been completely restored. Thorough suctioning of the intratracheal or tracheostomy tube is carried out at the end of operation and at periodic intervals thereafter to guard against postoperative atelectasis and pneumonia.

Advantages of pentothal sodium for operations about the head and neck.—In addition to the advantages that have already been discussed, pentothal sodium possesses other properties that make it an excellent anesthetic agent for adult patients undergoing reconstructive surgery. It is nonexplosive and can be administered with high concentrations of oxygen alone or with nitrous oxide-oxygen as supplementary agents. No detrimental effects have been observed from its use

*I do not concur with the opinion that curare or its derivatives cause relaxation of the vocal cords. On the contrary, severe laryngospasm and bronchospasm have followed its use in a few cases.

in patients with severe cardiac, renal, or metabolic disorders, including disturbances of hepatic function. It can be employed without fear of untoward consequences in the presence of diseases of the respiratory tract except in patients with a pronounced reduction of vital capacity. Even asthmatic patients have been anesthetized uneventfully with the drug, but in these cases preoperative medication included atropine, gr. 1/50, and benadryl, 50 mg., as precautionary measures, and bronchodilating drugs were kept in readiness throughout the operation. The low incidence of nausea and vomiting following pentothal sodium anesthesia encourages the early institution of a nutritious diet with resultant beneficial effects on the recovery of the patient and the healing of the operative wound. If the surgical procedure permits, the majority of patients are allowed out of bed on the operative or first postoperative day. This early ambulation helps to reduce the incidence of postoperative respiratory complications.

Disadvantages of pentothal sodium for operations about the head and neck.—The only major disadvantage to the use of pentothal sodium for operative procedures about the head and neck is an occasional undue prolongation of the recovery time. In many cases this bears little direct relation to the age or physical state of the patient or the dosage of the barbiturate.

Several different methods of solving this problem have been tried during the past years and have met with varying degrees of success. Among these has been the use of such drugs as coramine, Metrazol, and caffeine sodium benzoate. It is my impression that the analeptic agents have no salutary effect on the period of narcosis except in those patients who would have reacted within a short time after the termination of operation without the aid of a central nervous system stimulant.

Evipal sodium was substituted for pentothal sodium in a recent series of cases on the basis of published reports[5] of decreased toxicity and shorter duration of action. Although the recovery time was not materially reduced by the use of this drug, the patients seemed to have less residual drowsiness than is observed after pentothal sodium anesthesia.

The most promising solution to the problem has been afforded by the administration of fractional doses of *d*-tubocurarine chloride throughout the operative procedure.[6] In the cases in which it has been tried, this combination of pentothal sodium and a curare derivative has provided smooth anesthesia with a relatively small dose of barbiturate. The patients have reacted either before leaving the operating room or within a short period after their return to the ward.

SUMMARY

The principles underlying the successful administration of general anesthesia to patients undergoing reconstructive surgery about the head and neck have been discussed. Intratracheal technics, employing ether or cyclopropane for children and pentothal sodium for adults, have provided the most satisfactory anesthesia from the standpoint of both surgeon and anesthetist.

5. Volpitto, P. P., and Benton, C. C.: Evipal sodium — *d*-tubocurine chloride for endotracheal intubation: preliminary study. Anesthesiology 2: 164-166, March 1950.

6. Miller, R. A.: Personal communication to the author.

NOTES

CASE REPORTS are the foundation of the medical literature. Their brevity makes them interesting to write and assures their being read. There is a place in this section of NOTES for case reports as well as for descriptions of gadgets and special technics. Send in your contribution now. Other anesthetists will be helped by it.

MEASURES PROPOSED TO OBVIATE THE POSSIBILITY OF ADMINISTRATION OF THE WRONG GAS.*—An ever present hazard in the administration of anesthesia is the accidental installation of a cylinder of anesthetic gas in the oxygen yoke on the anesthesia gas machine. Recently a sufficient number of accidents from this cause have lent impetus to a movement to obviate this hazard. A considerable number of deaths have occurred owing to the administration of other gases in place of oxygen when resuscitation has been required, and at least three grand juries have demanded that steps be taken to prevent repetition of such unfortunate accidents.

One method under consideration consists of drilling holes or depressions around the outlet valve of a cylinder and using yokes on the anesthesia equipment that have pins corresponding to the holes. In this way installation of the wrong cylinder of gas would be impossible, since the gas could not go through the ordinary system of the machine.

The success of the method depends on its universal adoption by gas manufacturers, who would be responsible for drilling the cylinders, and on the purchasing of new yokes for gas machines or adapting some types now in use.

The simplest and most economical way of effecting the change would be to make it impossible for a cylinder of anesthetic gas to be installed in the oxygen yoke by changing that yoke.

The projected change will be submitted to the International Standards Association at a meeting to be held in July, and the standard should become effective immediately.

NEW ANESTHETIC GAS.—Xenon, an inert atmospheric gas used in neon signs, has been discovered to have anesthetic properties, according to an announcement made by the Linde Air Products Co. at an institute at St. John's Hospital, Springfield, Ill., on April 21.

The gas is produced as a by-product of the manufacture of oxygen and nitrogen, is noninflammable, and in clinical trials at the Iowa State University has proved to be an effective anesthetic agent. While the small quantities of the gas available and its costly production limit its availability and clinical application, its use in research may give valuable clues to a better understanding of the anesthetic process.

*Hospitals 25:114, April 1951.

LEGISLATION

Emanuel L. Hayt, LL.B.*

RESPONSIBILITY OF PHYSICIAN FOR NURSE ANESTHETIST.—The physician has the right to assume that the nurse employed by the hospital is competent. He is not chargeable with her incompetence unless he was aware of her lack of experience and skill. A duty rests upon him, however, to give proper instructions to the nurse, except as to her ordinary duties.[1]

If the surgeon himself selects the nurse anesthetist, he is expected to exercise the same degree of knowledge, skill, and care in the choice as he is required to display in the performance of any part of the operation.[2] During the course of the operation the surgeon must see that no preventable injury occurs to the patient when he is under anesthesia.[3]

It is the duty of the nurse anesthetist to watch the patient's color, pulse, respiration and reflexes, and the flow and color of the blood, for "no matter how far science may have advanced, the anesthetist must always be alert and vigilant during the operative procedure. The greatest skill will serve the anesthetist naught if she relaxes her vigilance at any time."

In the course of a tonsillectomy the nurse anesthetist employed by the charitable hospital administered ether. The child started to come out of the anesthesia twice; more ether was administered. After the third increase in ether the swabbed blood appeared very dark; respiration ceased. While the surgeon applied artificial respiration, she went to secure a mechanical resuscitator. When she returned with it, three or four minutes later, the child was dead. Action was brought against the hospital and the two operating surgeons, who gave their opinion that lack of sufficient oxygen was a cause of death and that if the mechanical resuscitator had been available at once the child might have been saved. The autopsy report indicated the cause of death as "inspiration of hemorrhagic material," caused by a stoppage of suction, which in turn was caused by the need for resuscitation. A master-servant relationship was held to exist between the hospital and nurse anesthetist. The negligence of the nurse anesthetist was imputed to her employer, the hospital, on the theory of respondeat superior.[4]

* Counsel for A.A.N.A.

1. Morrison v. Henke, 165 Wis. 166, 160 N.W. 173.
2. Frank v. South, 175 Ky. 417.
3. Aderhold v. Bishop, 94 Okla. 203, 221 P. 752.
4. Cavero v. Franklin General Benevolent Society, 18 C. C. H. Neg. Cases 939 (Cal.).

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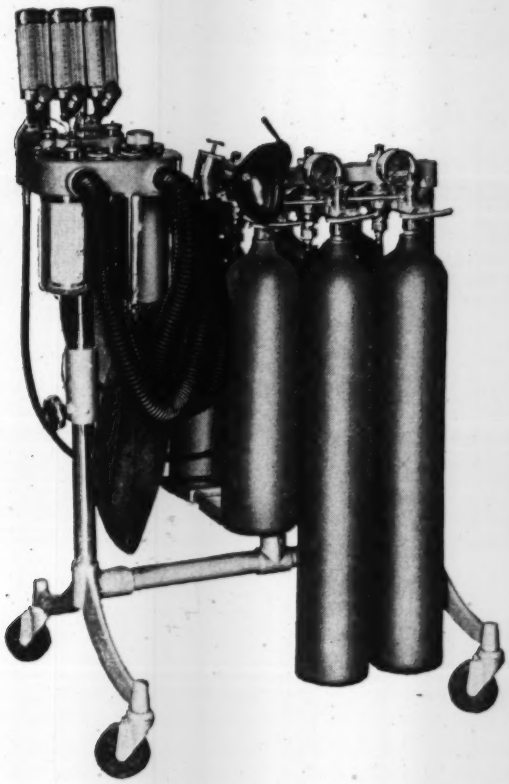

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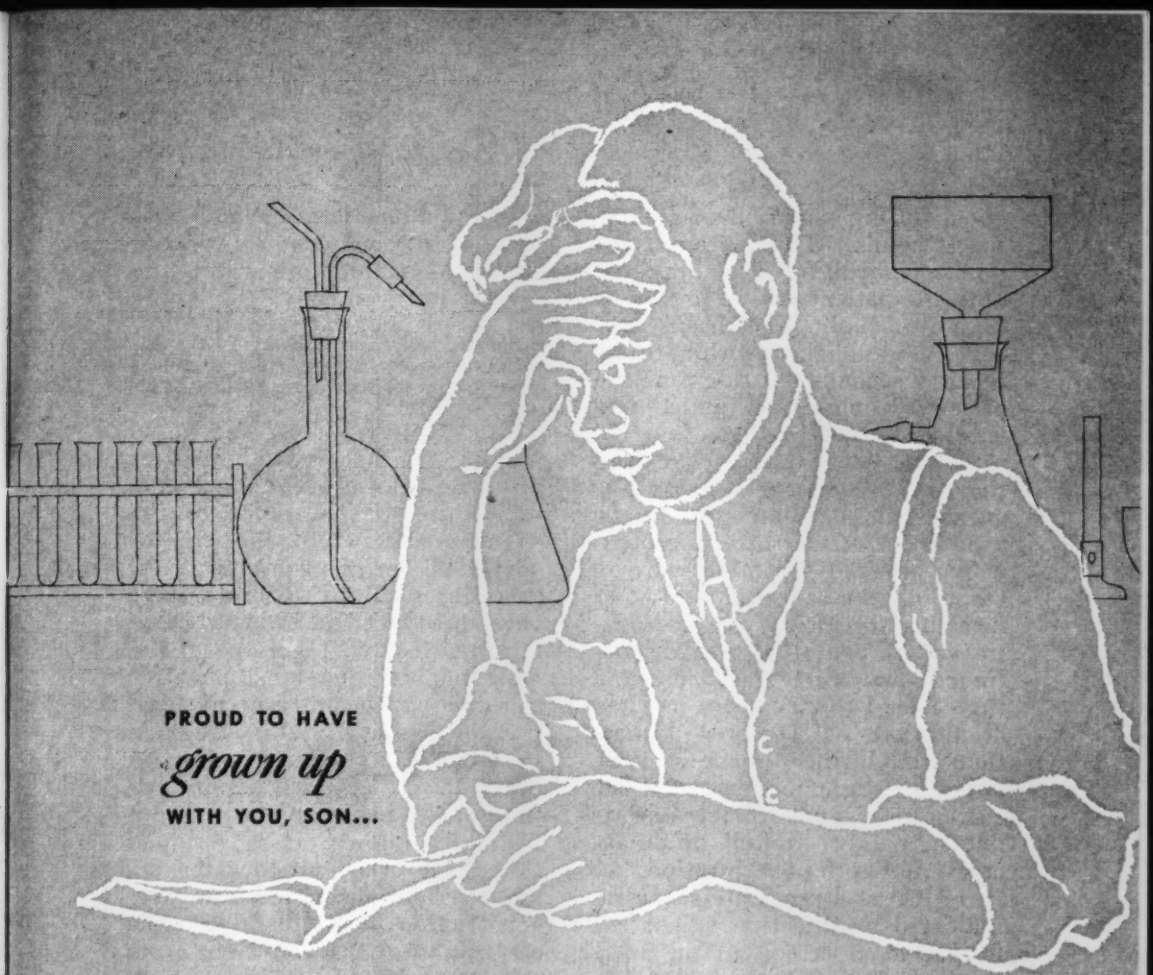
ABSTRACTS

Brigden, W.; Howarth, Sheila, and Sharpey-Schafer, E. P.: Postural changes in the peripheral blood-flow of normal subjects with observations on vasovagal fainting reactions as a result of tilting, the lordotic posture, pregnancy and spinal anaesthesia. Clin. Sci. 9:79-91, May 30, 1950.

"When normal subjects were tipped from the supine to the erect posture there was a decrease in right auricular pressure and cardiac output and a decrease in the forearm flow. The decrease in forearm flow did not occur in sympathectomised forearms. Blood pressure was maintained. Some normal subjects, with a history of fainting easily, showed after a period in the erect posture vasodilation in the forearm which paralleled the fall in blood pressure. Some young normal subjects in the erect lordotic position showed a further fall of right auricular pressure but a rise of inferior vena caval pressure. In spite of extreme tachycardia cardiac output fell to low levels. Initial constriction in the forearm and maintenance of blood pressure was followed by forearm vasodilatation, fall of blood pressure and bradycardia. The kyphotic position restored the circulation. In late pregnancy, the strict supine position resulted in a fall of auricular pressure and cardiac output, a rise in leg vein pressure and constriction in the forearm. The circulation was restored to normal by turning slightly to one side. Following spinal anaesthesia tipping into the semi-erect posture caused initial further constriction in the forearm followed by dilatation and a great fall in blood pressure. A case of spinal cord syphilis showed similar responses."

Crigler, Ralph E.: Pentothal sodium in anorectal surgery; analysis of 1,500 cases. Am. J. Surg. 79: 140-143, Jan. 1950.

"The author wishes in this article to present his observations as a surgeon of the use of pentothal sodium anesthesia given by a trained nurse anesthetist in 2,531 consecutive cases anesthetized for minor anorectal operations. Of these cases 1,500 were for operative procedures and 1,031 for the postoperative removal of rectal packs. . . . In this series the patients were admitted to the hospital the day before surgery. A complete blood count, urinalysis, routine history and physical examination were made. Preoperatively, the patients were given a liquid diet for their evening meal, a cleansing enema, sodium amytal, 3 gr., and seconal, 1½ gr., at bedtime the evening preceding surgery. Variations in this routine were used with children and aged patients. Thirty minutes prior to surgery, dilaudid, gr. 1/32, and atropine, gr. 1/150, were given hypodermically unless age or condition warranted a different dosage. Different concentrations of pentothal sodium solutions ranging from 0.5 per cent to 5 per cent have been given. . . . In this series only a 5 per cent solution was used. The patient was placed in the lateral Sims position and given 1 cc. of the drug over a period of four to six seconds, after which he was encouraged to talk or count. A second cc. was then



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given during a period of five to six seconds. This intermittent type of injection was repeated until the patient ceased to talk or count. Light anesthesia was usually established within thirty to forty seconds. At this time the patient's tongue was pulled forward and an airway was inserted to assure clear passage. Before the anesthetic was started the gas-oxygen machine was made available and metrazol, picrotoxin, curare and coramine were in reach of the anesthetist. After inserting the airway the administration of pentothal was discontinued for thirty seconds and thereafter 1 to 2 cc. were injected at intervals as indicated. Indications for further injection were noted by slight movement of the extremities, reflex movements due to painful stimuli or an increase in depth of respiration. . . . In all these cases, unless contraindicated by infection or abscess formation, 5 cc. of an oil anesthetic (zylcaine) were injected in and about the perianal region before any surgery was started . . . . The amount of pentothal given varied from 0.13 to 2 Gm. The average duration of anesthesia from the time the anesthetic was started until the patient awoke in the room was fifty-one minutes. The average time consumed for the operation was twenty minutes. . . . We still use the old-fashioned rectal pack of cotton and vaseline gauze wrapped around a rubber catheter. . . . Since December, 1946, we have been removing these rectal packs in the patient's room under pentothal anesthesia. The patient is in a lateral Sims position and 3 to 6 cc. of a 5 per cent solution of pentothal sodium are given the patient intravenously."

Bonica, J. J., and Backup, P. H.: Intrathecal use of vasoconstrictors to prolong spinal anesthesia. Northwest Med. **49**: 115-117, Feb. 1950.

"One of the most significant disadvantages of spinal anesthesia is the disappearance of the effectiveness before the end of operation in lengthy surgical procedures. Many technics have been introduced in order to obviate this disadvantage, one of the most popular and most effective of which is the intrathecal addition of vasoconstrictor drugs in the spinal anesthetic agent in order to prolong its action. Although the mode of action is not definitely known, it is assumed that these drugs produce the desired results through local vasoconstriction and thus delay the absorption of the anesthetic from the subarachnoid space. . . . An attempt was made to evaluate the efficacy of neosynephrine, epinephrine and ephedrine to prolong spinal anesthesia in a controlled series of 631 spinals administered to 487 patients. With the dosage and technic used during this investigation, neosynephrine and epinephrine both increased it about 20 to 30 per cent. It is possible that with larger doses of ephedrine, a greater increase may be obtained. No increase in the incidence of complications such as nausea, vomiting, blood pressure disturbances or neurologic sequelae were observed."

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BOOK REVIEWS

Personnel Administration in Public Health Nursing. By William Brody, Director of Personnel, New York City Department of Health; Lecturer in Public Health Administration, Johns Hopkins Hospital. Cloth. 209 pages, illustrated. St. Louis: C. V. Mosby Co., 1951. $3.25.

Although this book is a specific discussion of personnel administration in public health nursing, its subject is one that can be studied with interest by any person who is involved in the employment of others.

The job for the nurse, the nurse for the job, evaluation of service, education during employment, salary and working conditions, and promotions are some of the aspects of the subject covered. Personnel practices according to modern principles, with specialists as advisors, have developed the present widespread use of the merit system in public service. The problems as presented by the author will be applicable to other fields.

Appendix A outlines a self appraisal of a personnel program. Appendix B lists typical short answer examination questions for public health nurses of New York. A bibliography and an index complete the volume.

Human Anatomy and Physiology. By Nellie D. Millard, R.N., M.A., Science Instructor, University of Illinois, Cook County School of Nursing, Chicago, and Barry G. King, Ph.D., Medical Division, Aviation Safety, Civil Areonautics Administration; Lecturer in Physiology, University of Maryland. Ed. 3. Cloth. 596 pages, 309 illustrations. Philadelphia: W. B. Saunders Co., 1951.

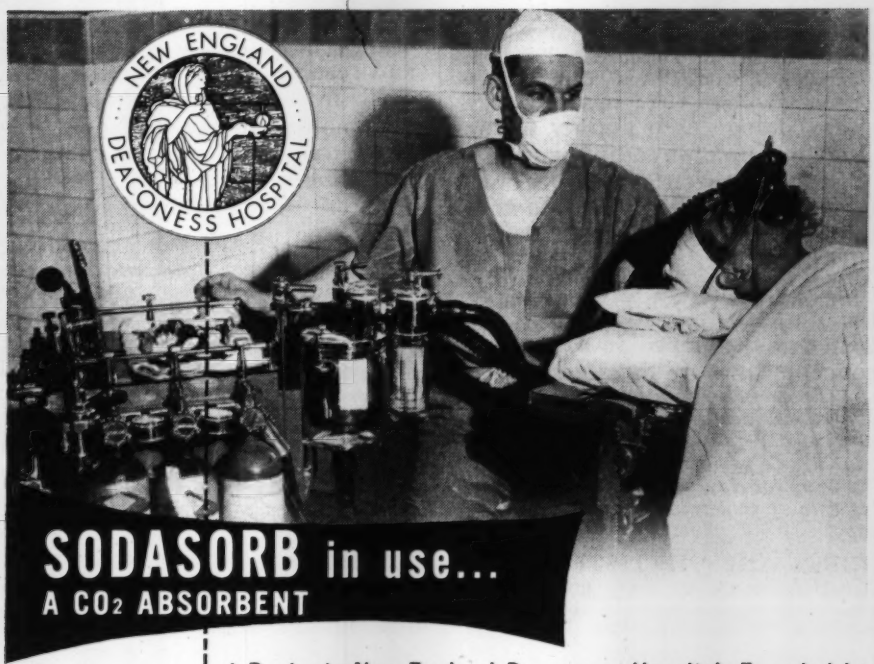
This well organized text on human anatomy and physiology has been brought up to date, and the various sections have been revised to improve the presentation of the material. Of particular interest to anesthetists will be the chapters on the circulatory, respiratory, and nervous systems and parts of the chapters on metabolism and the endocrine system. These will be found of particular value in reviewing these subjects as a preliminary to the class instruction of student anesthetists.

A History of Nursing. By Gladys Sellew, Ph.D., R.N., Chairman of Department of Sociology and Social Work, Rosary College, River Forest, Ill., and C. J. Nuesse, Ph.D., Assistant Professor of Sociology, the Catholic University of America, Washington, D.C. Ed. 2. Cloth. 439 pages, illustrated. St. Louis: C. V. Mosby Co., 1951. $3.75.

This history of nursing has been developed with the thesis that nursing is but a part of all human culture. Sociology, medicine, industry, and religion are a few of the phases that are briefly incorporated into the story. Professional development and the integration of nursing into comtemporary American problems occupy a large portion of the text.

It would seem that in the effort to place the history of nursing into the larger perspective, the authors have attempted too much in so small a volume. The result is that neither nursing nor the broader subject has been treated adequately.

A summary, questions for study and discussion, and lists of suggestions for reading follow each chapter. Footnotes contain bibliographic data for source material.



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Psychology for Nurses. By Bess V. Cunningham, Ph.D., Professor of Education, University of Toledo. Ed. 2. Cloth. 382 pages, illustrated. New York: Appleton-Century-Crofts, Inc., 1951.

Psychology as it applies to the student nurse in adjusting herself to the new situations of training and a general introduction to the subject comprise the first chapters of this text. The main theme, psychology as it applies to the nurse in relation to her patients, is developed from general concepts to more detailed discussion of the human organism, variations in behavior, and causes and results. Tests that have been used in evaluating intelligence, personality, and other factors related to psychology and reports of studies are presented. The final chapter, unlike the others, is a projection of the place that psychology will hold for the nurse in the future.

A summary, suggested activities, and suggested reading lists follow each chapter.

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WANTED: Two nurse anesthetists. The Lying-In Department of the New York Hospital, 530 E. 70th St., New York 21, N. Y. Would like two anesthetists experienced in obstetric and gynecologic anesthesia. Attractive salary and good personnel policies. One month vacation. Quarters available if desired. Forty hour week. Apply: Chief Anesthetist, M-822, at the above address.

WANTED: Two nurse anesthetists to serve in a private general hospital of 188 beds. Maintenance can be furnished, if desired. Salary open. Limited night call. Free every fourth weekend from Friday noon to Monday morning. Apply: Mr. A. Langehaug, Superintendent, Fairview Hospital, Minneapolis, Minn.

NURSE ANESTHETIST: For 276 bed general hospital. Pleasant working conditions. Salary open. Complete maintenance, if desired. Liberal employee benefits. Anesthesiologist in charge of department. Apply: Personnel Director, Lawrence & Memorial Assoc., Hospitals, New London, Conn.

WANTED: Two nurse anesthetists; A.A.N.A. members. Permanent. Desirable working conditions. Address: H. E. Alberti, Administrator, Winchester Memorial Hospital, Winchester, Va.

ANESTHETIST: Excellent salary; full maintenance. Good working conditions. Two anesthetists employed. 63 bed modern hospital; college town. Apply: Administrator, Centre County Hospital, Bellefonte, Pa.

WANTED NURSE ANESTHETIST: 74 bed modern general hospital. Salary: $350 per month; meals and laundry of uniforms. Apply to: Administrator, Radford Community Hospital, Radford, Va.

NURSE ANESTHETISTS (2): 400 bed hospital. Other nurse anesthetists. Department under supervision of medical anesthesiologist. Starting salary $350. No maintenance. Only occasional emergency work. Every full Sunday and Saturday afternoon off. Vacation with pay. Apply: Director of Anesthesia, St. John's Hospital, 307 S. Euclid Ave., St. Louis 10, Mo.

ANESTHETISTS: Organizing new department obstetric anesthesia. 373 bed, fully approved general hospital. Completing plans for 200 bed expansion. Large active obstetric service; excellent equipment; 44 hour week; vacation and sick leave policies; salary open. Apply: Personnel Director, Aultman Hospital, Canton, Ohio.

WANTED: Anesthetists; apartments furnished for married anesthetists; fine working conditions in suburb near Chicago; we employ six anesthetists; good salary. F. J. McCarthy, Administrator, MacNeal Memorial Hospital, Berwyn, Ill.

St. Christopher's Hospital for Children, Philadelphia 33, Pa., desires a well qualified NURSE ANESTHETIST who has had experience in pediatric anesthesiology. Salary and maintenance.

IMMEDIATE OPENINGS AVAILABLE: A.A.N.A. members with complete graduate course in anesthesia, 40 hour week: Permanent. Starting salary $3,862. Automatic increases. 600 bed hospital. Living facilities available. Write stating experience, age, and references to: Personnel Director, Harper Hospital, Detroit, Mich.

Wanted: NURSE ANESTHETIST for 150 bed hospital. Salary between $300 and $335. Two weeks after one year and three weeks' vacation after two years. Fourteen days' sick leave each year. Housing (if available) and meals offered at minimum charge. Excellent equipment. Apply: Box C-20, Journal A.A.N.A., 116 S. Michigan, Chicago 3, Ill.

NURSE ANESTHETIST for 80 bed hospital. Closed staff of doctors, all board men; mostly orthopedic cases. Salary open. Will furnish meals and laundry of uniforms. Contact C. E. Babcock, Director, Bone and Joint Hospital, Oklahoma City, Okla.

Opportunity for NURSE ANESTHETIST in Hawaii. Apply to: Administrator, Kapiolani Maternity and Gynecological Hospital, Honolulu, T. H. Travel expense from West Coast advanced. Hospital situated ten minutes from downtown Honolulu.

NURSE ANESTHETISTS (3) to work with anesthesiologist in 300 bed hospital. Salary open. Apply: Chief, Anesthesia Dept., The Mercer Hospital, Trenton, N. J.

ANESTHETISTS: Two urgently needed. One for relief. Modern well equipped hospital, employing only graduate staff. Attractive location. Steady increases in salary. Apply to: Dr. John Branford, Good Samaritan Hospital, Portland, Ore.

Immediate opening for a NURSE ANESTHETIST in a general surgical hospital; 415 beds; no obstetrics. Beginning cash salary $310 per month with periodic increases. Apply to: Department of Anesthesia, The Roosevelt Hospital, New York 19, N. Y.

NURSE ANESTHETIST: 600 bed university connected hospital. Department directed by medical anesthetist. Meals, laundry, vacation, sick leave, hospitalization allowed. Apply: Director, Department of Anesthesia, John Gaston Hospital, Memphis, Tenn.

STAFF ANESTHETIST for large general city hospital affiliated with Western Reserve Medical School. Staff consists of chief and five staff anesthetists. Room in Nurses' Residence, laundry and meals are available at moderate cost. Stanley A. Ferguson, Superintendent, City Hospital, 3395 Scranton Rd., Cleveland 9, Ohio.

NURSE ANESTHETIST WANTED to complete staff of five. 260 bed Ohio hospital doing obstetric and surgical anesthesia. Salary $325 month plus complete maintenance. Apply: Box K-10, Journal A.A.N.A., 116 S. Michigan Ave., Chicago 3, Ill.

WANTED: Anesthetist nurse for 205 bed hospital near St. Louis. Salary open. Apply to Sister Administrator, St. Joseph's Hospital, Alton, Ill.

NURSE ANESTHETIST: Fine opportunity in 75 bed general hospital, ACS approved. Large out-patient department averaging 23,000 patients. Closed staff of six surgeons. Department has two anesthetists. Building and expansion program requires a third. Salary open. Complete maintenance. Liberal personnel policies. Beautiful, historic, river town. Experience in endotracheal anesthesia preferred. State training and experience. Apply: Miss Dorothy E. Finley, R.N., Anesthesia Department, Holzer Hospital and Clinic, Gallipolis, Ohio.

ANESTHETIST needed for April, May, and June 1951. Write: Miss Margaret Beard, Highland Park Hospital, Highland Park, Ill.

WANTED: Two anesthetists for Hibbing General Hospital. We have three anesthetists now, and "call" hours are arranged among them. There is no O.B. "call" after 11:00 p.m., as we have a Sister who takes this "call" from that time to 6:00 a.m. The salary is open for this position. Apply: Administrator, Hibbing General Hospital, Hibbing, Minn.

WANTED: Anesthetist for surgery and obstetrics. 200 bed, modern hospital. Pleasant working conditions; good hours. Liberal salary, vacation, and personnel policies. For particulars, write: Chief Anesthetist, Jameson Memorial Hospital, New Castle, Pa.

Wanted: Two ANESTHETISTS for 166 bed, modernly equipped hospital, accepting only private patients. Located in the heart of Tidewater, Virginia; easily accessible to the beaches, Colonial Williamsburg, Jamestown, and other points of historic interest. Salary open. Apply to: Mrs. Mildred L. Bradshaw, R.N., Superintendent of Nurses, Leigh Memorial Hospital, Norfolk 7, Va.

ANESTHETIST: 200 bed hospital in Minneapolis. Will be five anesthetists alternating call every fifth day and every fifth week end. One month paid vacation. New operating rooms, all types of anesthetic agents used. Salary open, either with or without maintenance. Write, Sister Anna Bergeland, Superintendent, Lutheran Deaconess Hospital, Minneapolis 4, Minn.

NURSE ANESTHETIST: 500 bed teaching hospital. Starting salary $4323 per year with stated periodic increases. Apply: Harold F. Chase, M.D., Director of Anesthesiology, University of Virginia Hospital, Charlottesville, Va.

NURSE ANESTHETISTS: General surgery only. Directed by medical anesthesiologist; 3 resident physicians; 17 nurse anesthetists. Average 40 hour week; minimum night call. Week end call approximately every fourth week. Four weeks' vacation; ten days' sick leave yearly with pay. Excellent living and working conditions. Salary $300-$330 monthly. Apply: The New York Hospital, Cornell University Medical Center, 525 E. 68 St., New York 21, N. Y.

WANTED: Anesthetists for 240 bed general hospital. Attractive working conditions. Very little obstetrics. $275-$325 depending on qualifications. Apply: Director Department of Anesthesia, St. Joseph's Hospital, Lancaster, Pa.

NURSE ANESTHETIST: 87 bed general hospital. A.C.S. approved. One full time nurse anesthetist already on duty. Salary open. Maintenance, vacation with pay, sick leave furnished. Apply Director, Harford Memorial Hospital, Havre de Grace, Md.

NURSE ANESTHETIST wanted for 200 bed, completely modern hospital. Community of 28,000, one and one-half hours from beach resort. Salary open. Complete maintenance furnished. Contact Mark Stanton, Administrator, The McLeod Infirmary, Florence, S. C.

ANESTHETIST: Nurse. 141 adult beds for white women only. Also to administer intravenous fluids. Full maintenance. State salary required. Apply: Director, Women's Hospital, Baltimore 17, Md.

NURSE ANESTHETIST: Modern, well equipped 100 bed hospital. Midwest. Apply to: Sister Administrator, St. Francis Hospital, Kewanee, Ill.
NURSE ANESTHETIST: Methodist Hospital, Indianapolis, Ind.

ANESTHETIST, R.N.: Fully experienced for small general hospital; excellent salary and maintenance. Write: Mr. Herman R. Goldberg, Administrator, Northern Liberties Hospital, 7th and Brown Sts., Philadelphia, 23, Pa.

NURSE ANESTHETIST needed for a 200 bed hospital. Staff three anesthetists. Apply to: Sister Administrator, St. Anthony's Hospital, Rock Island, Ill.

WANTED: Two nurse anesthetists June 1, 1951. 230 bed general hospital; pleasant working conditions; maintenance optional; salary discussed. Apply to: Sr. M. Annunciata J., Mercy Hospital, Portland 3, Maine.

WANTED: Nurse anesthetist. Starting salary $300. Maternity and general service. Sick leave and paid vacation, also six national holidays paid. Eighty bed, fully approved hospital. Call rotated with three nurse anesthetists, under medical supervision. Apply: Lillian M. McDonald, R.N., Superintendent, Salem General Hospital, Salem, Ore.

WANTED: A nurse anesthetist. 550 bed hospital connected with medical college. Apply to: Dr. Alice McNeal, Director, Jefferson-Hillman Hospital, Birmingham, Ala. Salary $350 per month, increased to $400 at end of first year.

NURSE ANESTHETIST for 110 bed hospital. Four anesthetists employed. Salary $350 per month. Pleasant working conditions. Hospital approved by A.M.A. and A.C.S. Apply: Superintendent, Misericordia Hospital, 2224 W. Juneau Avenue, Milwaukee 3, Wis.

CONTRIBUTIONS to the JOURNAL should be typewritten, double-spaced, on one side of white typewriter paper. The author's name and hospital or university affiliations should be typed on the first page.

Illustrations submitted with an article should be glossy prints. Each illustration should carry a number and the author's name on the back. Legends for illustrations should be typed on a separate page at the end of the manuscript.

References should be complete and should also be typed on a separate page. Superior figures should be used to indicate the placement of the references in the text.

Manuscripts should be sent to the Editor, Journal American Association of Nurse Anesthetists, 116 S. Michigan Ave., Chicago 3, Ill.

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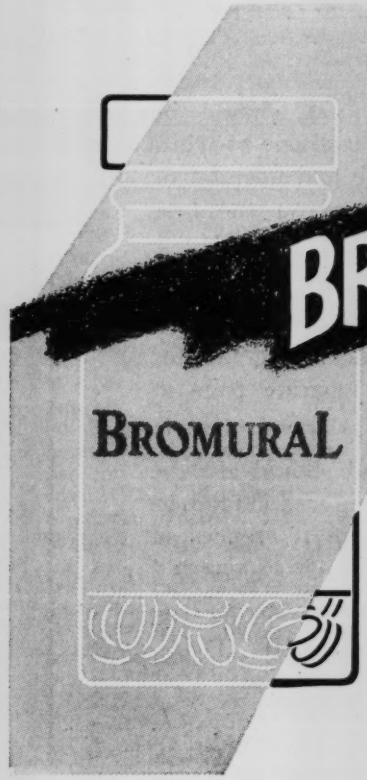

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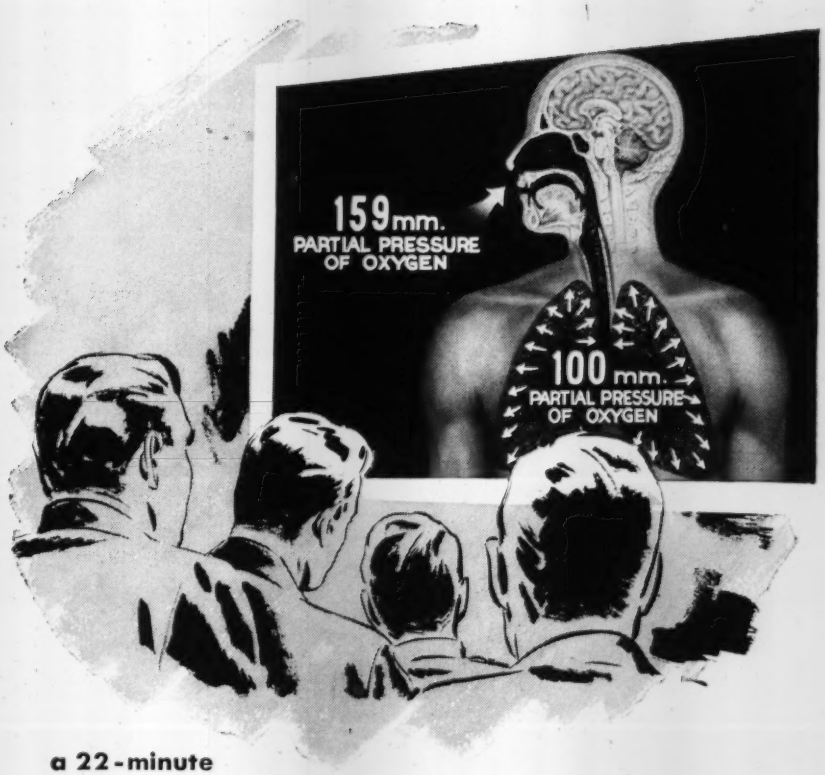

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